PROJECT MANUAL
100% CONSTRUCTION DOCUMENTS
971805

CITY OF PHARR/PSJA AQUATIC FACILITY

PROJECT NO. 1819-35-510-C011-051

Dr. Ambrosio "Amos" Hernandez	Mayor	Jesus "Jesse" Zambrano	Preside
Eleazar Guajardo	Commissioner	Jorge "George" Palacios	Vice-President Roberto
"Bobby" Carrillo	Commissioner	Jorge Zambrano	Secretary-Treasurer
Ramiro Caballe	Commissioner	Ricardo "Rick" Pedraza	Asst. Secretary-Treasurer
Daniel Chavez	Commissioner	Victor Perez	Member
Ricardo Medina	Commissioner	Jesus "Jesse" Vela, Jr.	Member
Itza Flores	Commissioner	Carlos G. Villegas, Jr.	Member
		Dr. Daniel P. King	Superintendent

Alex Meade, City Manager
Omar Anzaldua, Jr., PE, CFM, City Engineer

Volume I

Set Number_____

JUNE 07, 2019

DOCUMENT 00 01 10
TABLE OF CONTENTS
PROJECT MANUAL
100% CONSTRUCTION DOCUMENTS

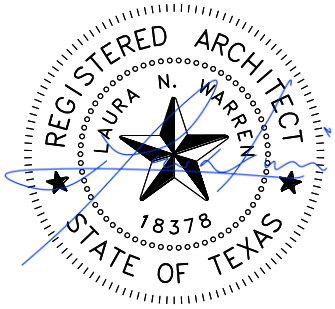
DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01-GENERALREQUIREMENTS

DOCUMENT 00 01 07
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT	The Warren Group Architects Inc. Texas Registration No. 30112289 Sections except where indicated as prepared by other design professionals of record.



EXP 10-31-2019

END OF DOCUMENT

SECTION 00 0110

TECHNICAL CIVIL-SITE SPECIFICATIONS
TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

1.01 DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

SPECIFICATIONS

2.01 DIVISION 01 -- GENERAL REQUIREMENTS

2.02 DIVISION 03 -- CONCRETE

2.03 DIVISION 31 -- EARTHWORK

2.04 DIVISION 32 -- EXTERIOR IMPROVEMENTS

2.05 DIVISION 33 -- UTILITIES

A. 33 0513 - Storm Sewer Appurtenances
B. 33 0514 - Fiberglass Manholes and Wetwells
C. 33 1116 - Water Transmission lines and/or pressure sewer lines
D. 33 1300 - Disinfecting of Water Utility Distribution
E. 33 3111 - Site Sanitary Utility Sewerage Piping
F. 33 4111 - Site Storm Utility Drainage Piping

THESE SPECIFICATIONS ARE INTENDED TO COVER ALL CIVIL WORK RELATED WITH THE CITY OF PHARR/PSJA AQUATIC FACILITY PROJECT, FIVE FEET OUTSIDE OF THE PROPOSED BUILDING. THE CONTRACTOR SHALL REFER TO ELECTRICAL, MECHANICAL, PLUMBING, AND ARCHITECTURAL SPECIFICATIONS FOR WORK NOT COVERED WITHIN.

END OF TABLE OF CONTENTS

Prepared for the City of Pharr/PSJA Aquatic Center Facilities

By:

PCE – Perez Consulting Engineers
808 Dallas Avenue
McAllen, Texas 78501
TBPE Firm No. 2158

Jorge D. Perez, P.E. 6/6/2019

DOCUMENT 00 01 07
SEALS PAGE

DESIGN PROFESSIONALS OF RECORD

Structural Engineer

Solorio, Inc. (F-1616)
Simon G. Solorio, PE
Texas Registration No. 83066
Sections except where indicated as prepared by other design Professionals of record.

The following sections:

02200 Earthwork
02282 Termite Control
02311 Rough Grading
03100 Concrete Forms
03151 Concrete Anchoring
03200 Concrete Reinforcement
03300 Cast-In-Place Concrete
03350 Concrete Finishing
03390 Concrete Curing
04230 Reinforced Unit Masonry
05120 Structural Steel
05210 Steel Joists
05310 Steel Deck
05400 Cold Formed Framing
05500 Metal Fabrications
07191 Vapor Barrier

END OF DOCUMENT

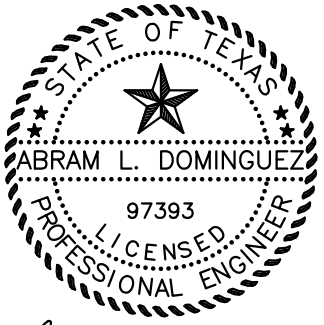
6/7/2019

DOCUMENT 00 01 07
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

MEP ENGINEERS MEP Solutions Engineering
Texas Registration No. F-9748
Abram L. Dominguez, P.E.
Texas Registration No. 97393
The following sections:

13852 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM
16051 - COMMON WORK RESULTS FOR ELECTRICAL
16060 - GROUNDING AND BONDING
16075 - ELECTRICAL IDENTIFICATION
16120 - CONDUCTORS AND CABLES
16130 - RACEWAYS AND BOXES
16140 - WIRING DEVICES
16145 - LIGHTING CONTROL DEVICES
16289 - SURGE PROTECTIVE DEVICES FOR LOW VOLTAGE POWER CIRCUITS
16334 - HIGH VOLUME LOW SPEED FANS
16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
16442 - PANELBOARDS
16461 - LOW-VOLTAGE TRANSFORMERS
16491 - FUSES
16511 - INTERIOR LIGHTING



June 7, 2019

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

MEP ENGINEERS MEP Solutions Engineering
Texas Registration No. F-9748
Luis Javier Peña, P.E.
Texas Registration No. 97260
The following sections:

15010 - MECHANICAL GENERAL REQUIREMENTS
15050 - MECHANICAL MATERIALS AND METHODS
15067 - HANGERS AND SUPPORTS
15077 - MECHANICAL IDENTIFICATION
15080 - MECHANICAL INSULATION
15110 - VALVES
15140 - DOMESTIC WATER PIPING
15150 - SANITARY WASTE AND VENT PIPING
15160 - STORM DRAINAGE PIPING
15183 - REFRIGERANT PIPING
15194 - FUEL GAS PIPING
15300 - FIRE PROTECTION SYSTEMS
15410 - PLUMBING FIXTURES
15415 - DRINKING FOUNTAINS AND WATER COOLERS
15430 - PLUMBING SPECIALTIES
15732 - ROOFTOP AIR CONDITIONERS
15736 - DUCT-FREE SPLIT SYSTEMS
15737 - POOL DEHUMIDIFICATION UNITS
15738A - SPLIT SYSTEM AIR HANDLING UNITS
15738B - SPLIT SYSTEM CONDENSING UNITS
15815 - METAL DUCTS
15820 - DUCT ACCESSORIES
15838 - POWER VENTILATORS
15840 - AIR TERMINAL UNITS
15855 - DIFFUSERS, REGISTERS, AND GRILLES
15900 - INSTRUMENTATION AND CONTROLS FOR HVAC
15901 - BUILDING AUTOMATION SYSTEM
15950 - TESTING ADJUSTING AND BALANCING
15955 – COMMISSIONING OF HVAC

June 7, 2019

END OF DOCUMENT

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

SECTION 00 01 15
LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled 100% Design Development, City of Pharr/PSJA Aquatic Facility, 3001 N Cage Blvd., Pharr, Texas, 78577 dated June 7, 2019, as modified by subsequent Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

ARCHITECTURAL:

G0.00 COVER SHEET
G0.01 GENERAL NOTES
A1.01 SITE PLAN
A1.02 SITE PLAN DETAILS
A1.11 OVERALL FLOOR PLAN- FIRST LEVEL
A1.11A FLOOR PLAN FIRST LEVEL- A
A1.11B FLOOR PLAN FIRST LEVEL- B
A1.11C FLOOR PLAN FIRST LEVEL- C
A1.12 FLOOR PLAN SECOND LEVEL
A1.21 OVERALL REFLECTED CEILING PLAN FIRST LEVEL
A1.21A RCP-FIRST LEVEL A
A1.21B RCP-FIRST LEVEL B
A1.21C RCP-FIRST LEVEL C
A1.22 REFECTED CEILING PLAN SECOND LEVEL
A1.31 ROOF PLAN
A1.41 ADD1 FLOOR PATTERN PLAN
A1.42 WALL ACCENT PLAN
A2.11 EXTERIOR ELEVATIONS
A2.12 EXTERIOR ENLARGED ELEVATIONS
A3.01 BUILDING SECTIONS
A3.02 BUILDING SECTIONS
A4.11 ENLARGED FLOOR PLANS
A4.12 ENLARGED FLOOR PLANS
A4.31 ENLARGED STAIRWAY PLANS
A4.32 ENLARGED STAIRWAY PLANS
A4.33 ENLARGED STAIRWAY PLANS
A4.34 STAIRWAY DETAILS
A5.11 ADD 1 DETAILS
A5.12 ADD 1 DOOR AND WINDOW DETAILS
A5.13 ADD 1 DOOR AND WINDOW DETAILS
A5.14 ADD 1 DOOR AND WINDOW DETAILS
A6.01 WALL TYPES
A6.11 FINISH SCHEDULE

A6.21 DOOR AND WINDOW SCHEDULE
A6.22 DOOR AND WINDOW ELEVATIONS
A7.11 MILLWORK ELEVATIONS
A7.12 MILLWORK SECTIONS

CIVIL:
C100 GENERAL NOTES & SURVEY CONTROL
C101 DIMENSION CONTROL & SIGNAGE PLAN
C102 DRAINAGE AREA MAP
C103 DRAINAGE AREA CALCULATIONS
C104 GRADING AND DRAINAGE PLAN
C105 STORM SEWER LINE “A”
C106 STORM SEWER LINE “B” & “C”
C107 WATER & WASTEWATER PLAN
C108 SANITARY SEWER LINE “A”
C109 EROSION CONTROL PLAN
C110 EROSION CONTROL DETAILS
C111 TYPICAL DETAILS
C112 TYPICAL DETAILS
C113 TYPICAL DETAILS
C114 TYPICAL DETAILS
C115 TYPICAL DETAILS
C116 TYPICAL DETAILS

LANDSCAPE:
L1.0 LANDSCAPE PLAN
L2.0 ADD 1 IRRIGATION PLAN

STRUCTURAL:
S100 OVERALL
S101 GENERAL NOTES
S102 GENERAL NOTES
S103 SCHEDULES
S201 PIER LAYOUT
S202 FOUNDATION PLAN
S203 FOUNDATION PLAN, GRADE BEAMS
S204 COLUMN LAYOUT PLAN
S205 MISC. STRUCTURES
S206 MONUMENT SIGN FRAMING PLANS
S207 MONUMENT SIGN SECTIONS AND ELEVATIONS
S301 BLEACHERS AND OBSERVATION FRAMING PLANS
S302 ROOF FRAMING PLAN
S303 HIGH ROOF FRAMING PLAN
S431 TYPICAL CONCRETE DETAILS
S432 FOUNDATION DETAILS
S433 FOUNDATION DETAILS
S434 HOLLOW CORE PLANKS DETAILS
S441 TYPICAL CMU DETAILS
S452 STEEL FRAMING DETAILS

S453 TYPICAL DETAILS
S551 TRUSS DETAILS
S552 TRUSS DETAILS
S601 ELEVATIONS
S602 ELEVATIONS
S603 ELEVATIONS
S604 ELEVATIONS
S605 BUILDING SECTIONS
S606 BUILDING SECTIONS
S607 BUILDING SECTIONS
S608 BUILDING SECTIONS

POOL CONSULTANT:

SP0.00 POOL REFERENCE PLAN
SP1.00 COMPETITION POOL PLAN
SP1.01 COMPETITION POOL SECTIONS
SP1.02 COMPETITION POOL COURSE LAYOUTS
SP1.03 COMPETITION POOL COURSE LAYOUTS
SP1.04 COMPETITION POOL COURSE LAYOUTS
SP1.05 COMPETITION POOL COURSE LAYOUTS
SP1.06 COMPETITION POOL TIMING SYSTEM LAYOUT
SP1.07 COMPETITION POOL BULKHEAD PARKING PLAN
SP1.08 COMPETITION POOL DETAILS
SP1.09 COMPETITION POOL DETAILS
SP1.10 COMPETITION POOL DETAILS
SP2.00 DIVE POOL PLAN & SECTIONS
SP2.01 DIVE POOL DETAILS
SP2.02 DIVE POOL DETAILS
SP2.03 DIVE POOL DETAILS
SP3.00 ENDLESS POOL PLAN & SECTIONS (ALTERNATE #2)
SP4.00 POOL LOCATION POINT SCHEDULES
SP4.01 POOL LOCATION POINT PLAN
SP5.00 POOL SUCTION PIPING PLAN
SP5.01 POOL RETURN PIPING PLAN
SP6.00 POOL MECHANICAL ROOM PLAN
SP6.01 POOL MECHANICAL ROOM SECTIONS
SP6.02 SURGE TANK PLANS & SECTIONS
SP6.03 POOL MECHANICAL DETAILS
SP6.04 POOL MECHANICAL ROOM DETAILS
SP6.05 POOL MECHANICAL ROOM DETAILS
SP7.00 COMPETITION & DIVE POOL SYSTEMS SCHEMATICS
SP7.01 ENDLESS POOL SYSTEM SCHEMATICS
SP8.00 COMPETITION POOL STRUCTURAL PLAN
SP8.01 DIVE POOL STRUCTURAL PLAN
SP8.02 DIVE TOWER STRUCTURAL PLAN
SP8.03 DIVE TOWER ELEVATIONS
SP8.04 POOL STRUCTURAL DETAILS

MECHANICAL – ELECTRICAL – PLUMBING:

M1.00 MECHANICAL SITE PLAN
M1.01 MECHANICAL FLOOR PLAN
M1.02 MECHANICAL MEZZANINE PLAN
M1.03 MECHANICAL FLOOR PLAN
M1.04 MECHANICAL FLOOR PLAN
M1.05 MECHANICAL FLOOR PLAN
M1.06 MECHANICAL ROOM INTERIOR ELEVATIONS
M2.01 MECHANICAL SCHEDULES
M2.02 MECHANICAL SCHEDULES
M3.01 MECHANICAL DETAILS
M3.02 MECHANICAL DETAILS
M3.03 MECHANICAL CONTROLS DETAILS
E1.00 ELECTRICAL SITE PLAN
E1.01 ELECTRICAL LIGHTING FLOOR PLAN
E1.02 ELECTRICAL POWER FLOOR PLAN
E1.03 ELECTRICAL POWER FLOOR PLAN
E1.04 ELEC-MECH & PLBING EQUIP LOC FLR PLAN
E1.05 COMPETITION POOL TIMING SYSTEM LAYOUT
E2.01 ELECTRICAL RISER DIAGRAM, LEGEND AND SCHEDULES
E3.01 ELECTRICAL LIGHTING FIXTURE SCHEDULES
E4.01 ELECTRICAL PANEL SCHEDULES
E4.02 ELECTRICAL PANEL SCHEDULES
E5.01 ELECTRICAL DETAILS
P1.00 PLUMBING SITE PLAN
P1.01 PLUMBING SEWER FLOOR PLAN
P1.02 PLUMBING HW/CW FLOOR PLAN
P1.03 PLUMBING SEWER MEZZANINE PLAN
P1.04 PLUMBING HW/CW MEZZANINE PLAN
P1.05 PLUMBING ROOF PLAN
P2.00 PLUMBING SCHEDULES
P2.01 PLUMBING SEWER RISER DIAGRAM
P2.02 PLUMBING GAS RISER DIAGRAM

SECTION 00 11 00
NOTICE TO RESPONDENTS

PART 1 G E N E R A L

1.01 NOTICE TO RESPONDENTS

Formal **Competitive Sealed Proposals** addressed to Mr. Alex Meade, City Manager, City of Pharr, will be received on **Thursday, July 11, 2019 at 3:00 p.m.,** for the **City of Pharr/PSJA Aquatics Facility**. Project is located at 3001 N Cage Blvd., Pharr, Texas 78577. All submitted Proposals will be gathered at the Purchasing Department (2nd floor) of Pharr City Hall, at which time they will be taken to the City Commission Room and publicly opened and read aloud. Proposals must be in the City of Pharr's possession on or before the aforementioned date and time. Any proposal received after the closing time will not be accepted and returned to the respondent unopened. City of Pharr normal business days are Monday through Friday between the hours of 8:00 a.m. and 5:00 p.m. and closed on City recognized holidays. (Typed Proposal Tabulation shall be posted, on our website depicting all proposals received.)

CSP - CITY OF PHARR/PSJA AQUATIC FACILITY
COMPETITIVE SEALED PROPOSAL No. 1819-35-510-C011-051

Brief Description*: Project consists of approximately 72,796 square feet of new Aquatic Facility* with an alternate second level build-out of 1,212 s.f.

A Respondent's Bond from a reliable surety company licensed to operate in the State of Texas or certified Cashier's Check, payable without recourse to the City of Pharr, for the amount of not less than five (5) percent (%) of the total proposal shall accompany the proposal as a guaranty that, if awarded the contract, the respondent will enter into a contract with the City of Pharr within the time specified. Payment and Performance Bonds shall be executed in the amount of 100% of the awarded contract amount. Failure to execute contracts within the time specified shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited (Respondent's Bond) with his proposal.

Respondents receiving a "NOTICE TO RESPONDENTS" and/or "REQUEST FOR PROPOSALS" notice via e-mail, fax, or reading same in the newspaper are advised that they shall be required to go online to our Bidding Portal: https://pharr.procureware.com to obtain solicitation documents (Plans, Specifications, Proposal Forms, and Contract Documents). Potential respondents are expected to inspect the site of work and to inform themselves regarding all local conditions, which may affect their proposal.

Proposals are to be submitted in both **"electronic and hard-copy"** form. Any and all related Addendums issued shall be posted on our Bidding Portal. Potential Respondents are asked to post their questions on our bidding portal under the tab labeled "Clarifications/Questions" under the relative project number.

The City of Pharr reserves the right to refuse and reject any or all proposals, to waive any or all formalities, or technicalities, and to accept the proposal to be the best and most advantageous to the City and hold the proposals for a period of ninety (90) days without taking action.

Conditional proposals will not be accepted. Proposals sent via facsimile shall not be accepted. Proposals shall be sealed and prominently marked on the left-hand corner of the of proposal envelope with the corresponding project number and project title.

Hand-deliver Proposals:118 S. Cage Blvd, Purchasing Department (2nd Floor)

If using Land Courier (i.e., FedEx, UPS):118 S. Cage Blvd, Purchasing Department (2nd Floor)
Pharr, Texas 78577

Mail Proposals: P.O. Box 1729, Pharr, TX 78577

A **Pre-Proposal** Conference will be held **Thursday, June 27, 2019 at 4:00 p.m.** in the City Commission Room (2nd floor) of Pharr City Hall. All prospective respondents are encouraged to be in attendance.

Proposals shall be sealed and clearly marked: **Project No. 1819-35-510-C011-051 CSP- AQUATIC FACILITY.**

SECTION 00 18 00
RESPONDENT'S QUALIFICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

This section contains the respondent's qualifications for the project.

1.2 REFERENCES – Not Used

1.3 DEFINTIONS – Section 07 00 00

1.4 RESPONDENT'S QUALIFICATIONS

PART 2 - Proposers shall submit evidence in the form of a Contractor's Qualification Statement of compliance with the following requirements:

A. Respondent shall have experience, human resources and access to the equipment necessary for performing the project work.

B. The successful respondent shall appoint a "competent person" of the company to be full time supervisor or superintendent at the site. The competent person must be available at all times during the pendency of the project and must be available during "off-hours."

D. Respondent shall have completed similar projects in complexity and size within the past two (2) years.

E. Respondent shall have an established office in Texas with at least five (5) years of experience.

F. Respondent are to submit financial statements for the last three (3) years along with an "Accountants Review Report" from accountant.

Respondent shall submit with their Base Proposal in the same envelope a "Contractor's Qualification Statement", fully executed and indicating compliance with the above qualifications, on an original American Institute of Architects Document A305, 1986 Edition. Photo copies or facsimiles of the original forms will not be acceptable.

The City of Pharr will evaluate and consider, in the qualifications and acceptance of the Respondents, all information relevant to his interests and requirements, as provided on the Contractor's Qualifications Statement and any information on past work from references provided therein. The Owner reserves the right to qualify or disqualify any Proposal based on any information called for in the Contractor's Qualification Statement, in any names permitted by applicable law.

CONSIDERATION OF PROPOSAL

A. Properly identified Proposals received on time will be considered.
B. The City of Pharr shall have the right to reject any or all Proposals and in particular to reject a Proposal not accompanied by any required security bond or data required by the Contract Documents or a Proposal in any way incomplete or irregular.
C. The City of Pharr shall have the right to waive any formality or irregularity in any proposal received.
D. If the City of Pharr accepts any Alternates, the Owner shall have the right to accept them in any order or combination.
E. It is the intent of the City of Pharr to award a contract to the offeror submitting the proposal providing the "best value" to the city provided the Proposal has been submitted in accordance with the requirements of the Solicitation Documents, selection criteria, and adopted by the City of Pharr.
F. Award of Contract may include full consideration of Proposal Amount and Alternates if any. City of Pharr may accept or reject any or all alternates if any and make an award of contract as deemed in the best interest of the City. The City's decision shall be final.
G. The selection of a qualified Contractor shall be based on the enclosed Ranking Criteria.
H. Contractor may provide supplemental information to support selection criteria. The support information will not be disclosed to other Offerors.
I. The estimated budget is as follows: $21,500,000. (Twenty one million five hundred thousand U.S. dollars)

Ranking Evaluation and Ranking Criteria

The City of Pharr, City Commission has authorized the use of the Competitive Sealed Proposal method of solicitation. The following criteria and scoring matrix is hereby incorporated:

The City of Pharr reserves the right to apply all criteria as deemed appropriate and allowed in Texas Local Government Code 252 and 2269. Including but not limited to the below, and other relevant factors specifically denoted in the solicitation package. The City of Pharr specifically requests offerors to answer and provide information related to the following criteria. Questions left unanswered or omitted requested information may result in a partial or total reduction of allocated points.

	Criteria	**Weight**
	(Refer attached Ranking Criteria for Selection of Building Contractors)	
1.	Proposal Amount	40 Points
2.	Firm Experience/Key Personnel and Firm Stability/Management	25 Points
3.	Proposed Subcontractor Team Personnel. Please provide the names and complete resume of Key supervisory personnel to be assigned to the project. Key personnel that has demonstrated experience on projects of similar size and complexity.	7 Points

4. References — 10 Points
   Scaled Between
   Excellent – full credit
   Poor Experience or No Experience – No Credit

5. Past performance. Provide three letters of references from prior Owners that are dated within three years. More than three letters may be provided, but letters older than 3 years will not be considered. — 9 points

6. Financial Strength. Please provide the documents for the last three years addressing: — 9 points
   - Quality of Financial Statements
   - Financial Strength based on bank letter of reference required as part of the Proposal Response.
   - Bonding Capacity based on information from performance and payment bonding company required as part of the CSP Proposal

100 Points

Other Required Information to be submitted (No Point Value)

The Offer must submit the following items. No point values are assigned to these items but will be used in overall evaluation of Offeror.

1. Review and acknowledge the contract included in the Front End of the Specifications issued for this project and list any objections or modifications to the contract. (No Point Value – Basis of rejection dependent on gravity of revisions)

2. Provide certified financial statements for the past three (3) years. The City of Pharr reserves the right to disqualify firms that cannot show financial stability in a satisfactory manner to the Owner. Financial information provided will not be shared with anyone outside of the City of Pharr and the selection team.

3. Provide the number of Surety companies that your company has engaged over the last two (2) years, the name(s) of the Surety company, and the number of years that your firm has consistently engaged the Surety company(ies). (No Point Value – Basis of rejection dependent on Surety information)

Ranking Criteria for
Selection of Building Contractors

Project Name: _____ Contractor: _____

Project Location(s): _____ Proposal: _____

Ranking Date: _____ Proposal Opening Date: _____

CATEGORY	Maximum Score	Total Points Scored
1. PROPOSAL AMOUNT • Construction Cost	**40**	_____
2. FIRM EXPERIENCE / KEY PERSONNEL AND FIRM STABILITY • Team Organization Chart (proposed management team) 5 • Projects of Comparable Type and Size 5 • Firms Quality Control 5 • Firms Warranty Service Philosophy 5 • Demonstrated ability to successfully meet time schedules 5	**25**	_____
3. Proposed Subcontractor Team • Subcontractor Team	**7**	_____
4. References (10 pts) • Past Experience with City of Pharr PMSI, Architect and/or Consultants	**10**	_____
5. Past performance. Provide three letters of reference from prior Owners. Letters to be dated within three years. More than three letters may be provided, but letters older than 3 years will not be considered.	**9**	_____
6. Financial Strength. Please provide financial documents for the last three years addressing: - Quality of Financial Statements - Financial Strength based on bank letter of reference required as part of the Proposal Response. - Bonding Capacity based on information from performance and payment bonding company required as part of the CSP Proposal.	**9**	_____
TOTAL POINTS SCORED	**100**	**Grand Total** _____

1.5 STATEMENT OF QUALIFICATIONS AND OWNER'S REVIEW

A. Respondent shall submit in this section, a Contractors Qualifications Statement. The City of Pharr shall have the right to take such steps or perform such investigations as it deems necessary to determine the ability of the respondent to perform the obligations under this Contract, and the respondent shall furnish any and all information or data requested for this purpose. The City of Pharr reserves the right to reject any proposal if the evidence submitted by or investigation of such respondent fails to satisfy the City of Pharr that such respondent is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional proposals will not be accepted. Refer Supplementary Instructions to Respondents Document 00 22 13.

END OF SECTION

AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO: City of Pharr

ADDRESS: 118 S. Cage Blvd., Pharr, Texas 78577

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

[ ] Corporation
[ ] Partnership
[ ] Individual
[ ] Joint Venture
[ ] Other

NAME OF PROJECT: *(if applicable)* City of Pharr/PSJA Aquatic Facility

TYPE OF WORK: *(file separate form for each Classification of Work)*

[**X**] General Construction
[ ] HVAC
[ ] Electrical
[ ] Plumbing
[ ] Other: *(Specify)*

§ 1 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3.3 President's name:
§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:
§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:
§ 1.4.1 Date of organization:
§ 1.4.2 Type of partnership (if applicable):
§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:
§ 1.5.1 Date of organization:
§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)
§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4 REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5 FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6 SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of

Notary Public:

My Commission Expires:

Additions and Deletions Report for
AIA® Document A305™ – 1986

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 19:48:13 ET on 06/09/2019.

PAGE 1

SUBMITTED TO: City of Pharr

ADDRESS: 118 S. Cage Blvd., Pharr, Texas 78577

...

NAME OF PROJECT: *(if applicable)* City of Pharr/PSJA Aquatic Facility

...

[**X**] General Construction

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 19:48:13 ET on 06/09/2019 under Order No. 6323311914 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A305™ – 1986, Contractor's Qualification Statement , as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 21 00
INSTRUCTIONS TO RESPONDENTS

PART 1 - G E N E R A L

1.2 SECTION INCLUDES

This section contains the instructions to respondents for the project.

1.3 REFERENCES - Not Used

1.4 DEFINTIONS - Section 07 00 00

1.5 DOCUMENTS

A. Contract Documents, including Drawings and Technical Specifications are on file at the City Purchasing Office located at Pharr City Hall, 118 S. Cage Blvd. Pharr, Texas 78577. Plans, Specifications, Proposal Forms, and Contract Documents may be viewed electronically and downloaded by visiting our website at https://pharr.procureware.com.

B. Potential Respondents are asked to post their questions on the portal under the relative project number and project title.

C. Respondent should thoroughly examine and become familiar with the Contract Documents, including, but not limited to, the plans and specifications. By execution of the Contract, the Respondent (Contractor) shall be responsible for any and all obligations under the Contract and failure by Contractor to become acquainted with the Contract Documents will not relieve Contractor from such obligations.

1.6 ADDENDA AND INTERPRETATIONS:

A. No interpretations of the meaning of the plans, specifications, or other pre-proposal documents will be made orally to any respondent. Every request for such interpretation should be in writing and posted on our bidding portal: https://pharr.procureware.com such inquiries must be received at least four (4) days prior to the date fixed for the opening of proposals to be given consideration. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the specifications which, if issued, will be sent via e-mail through our portal. Failure of any respondent to receive any such addenda or interpretation shall not relieve such respondent from any obligation under his proposal as submitted. All addenda so issued shall become part of the contract documents.

1.7 NOTICES

A. The City of Pharr reserves the right to accept or reject proposals submitted waive formalities in the solicitation process; accept the proposal deemed most advantageous to the City of Pharr; and to hold the proposals for a period of ninety (90) calendar days without taking action.

B. Proposals may be held by the City of Pharr for a period not to exceed ninety (90) calendar days from the date of the proposal opening for the purpose of reviewing the proposals and investigating the respondent's qualifications prior to the contract award.

C. The City of Pharr is an Affirmative Action and Equal Opportunity Employer.

D. Small and minority firms are encouraged to submit proposals for this project.

1.8 PREPARATION OF PROPOSAL AND USE OF SEPARATE PROPOSAL FORMS:

A. This Contract and Specifications includes a complete set of solicitation document forms which are for the convenience of the respondents. Proposal forms furnished in this document shall be printed from the portal, documents requiring signature shall be printed/copied by the respondent and should be signed in ink.

B. **One Original proposal and two (2) copies** must be submitted in a sealed envelope bearing on the outside the name of the respondent, his address, and the name of the project for which the proposal is submitted with the Project number. If forwarded by mail, the sealed envelope containing the Original proposal must be enclosed in another envelope addressed as specified in the proposal form.

C. The use of subcontractors is allowed however the respondent is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract must be acceptable to the City of Pharr.

1.9 MODIFICATION:

A. Respondent shall not modify proposal by fax or other method at any time prior to the schedule closing time for receipt of proposals.

1.10 METHOD OF BIDDING (UNIT PRICES) WHERE APPLICABLE:

A. The unit prices for each of the several items in the proposal document of each respondent shall include its pro-rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price proposal represents the total proposal. Any proposal not conforming to the requirement may be rejected as informal. The special attention of all respondents is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increases or decreases in quantities, nor extra compensation allowed, provided the net monetary value of all such additive and subtractive changes in quantities of such items of work (i.e., difference in cost) shall not increase or decrease the original contract price by more than twenty-five (25%) percent, except for work not covered in the drawings and technical specifications and the Standard General Conditions for Construction Contract of agreement.

B. Awarding of Contract
THIS PROJECT WILL BE AWARDED TO BEST QUALIFIED CONTRACTOR THAT RANKS THE HIGHEST BASED ON EVALUATION CRITERIA (QUALIFICATIONS AND LOWEST BASE PROPOSAL WITHIN BUDGET).

C. Respondents must include all deductive and alternative proposals pricing as specified.

D. Incomplete proposals will not be considered.

E. If there is a discrepancy between prices quoted by written words or figures, the price quoted by words will govern.

1.11 PROPOSAL SECURITY:

A. Each proposal must be accompanied by cash, certified cashier's check or a proposal bond prepared on the form of proposal bond attached hereto, duly executed by the respondent as principal and having as surety thereon a surety company approved by the owner, in the amount of not less than five (5%) percent of the proposal. Such cash, checks, or proposal bonds will be returned to all except the three highest ranked respondents within forty-five (45) days after the opening of proposals, and the remaining cash, checks, or proposal bonds will be returned promptly after the City of Pharr and the accepted respondent have executed the contract or if no award has been made, within ninety (90) days after the date of the opening of proposals, upon demand of the respondent at any time thereafter, so long as he has not been notified of the acceptance of his proposal.

B. Liquidated damages for failure to enter into contract: The successful respondent, upon his failure or refusal to execute and deliver the contract and insurance certificates required within ten (10) days after he has received notice of the acceptance of his proposal, shall forfeit to the City of Pharr, as liquidated damages for such failure or refusal, the security deposited with his proposal.

1.12 PROJECT BONDING

A. This project requires a performance bond in the amount of 100% of the Contract amount.

B. This project requires a payment bond in the amount of 100% of the Contract amount.

C. This project will require a warranty on maintenance and defects to begin at acceptance of the project and for duration of one (1) year.

1.13 TIME OF COMPLETION AND LIQUIDATED DAMAGES:

A. Respondent must agree to commence work within ten (10) days of the written "Notice to Proceed" from the City of Pharr and Respondent is to submit a completion date with consecutive calendar days.

B. Respondent must agree also to pay as liquidated damages the sum of $1,000.00 dollars per day for each consecutive calendar day thereafter as provided in the general conditions.

1.14 CONDITIONS OF WORK:

A. Each respondent must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful respondent of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of, or interference with, the work of any other Contractor.

1.15 INSPECTION OF SITE:

A. Respondent should visit the site of the proposed work and become fully acquainted with the existing conditions of the site and with the facilities involved, with a special consideration to the difficulties and restrictions attending the performance of the Contract.

1.16 TEXAS GOVERNMENT CODE CHAPTER 2252.152 CONTRACTS WITH COMPANIES ENGAGED IN BUSINESS WITH IRAN, SUDAN, OR FOREIGN TERRORIST ORGANIZATION PROHIBITED

In accordance with Chapter 2252.152 of the Texas Government Code, Respondent is to acknowledge that (a) Respondent does not engage in business with Iran, Sudan or any foreign terrorist organization and (b) Respondent is not listed by the Texas Comptroller as a terrorist organization.

1.17 TEXAS GOVERNMENT CODE CHAPTER 2270 PROHIBITION ON CONTRACTS WITH COMPANIES BOYCOTTING ISRAEL

"In accordance with Chapter 2270, Texas Government Code, a government entity may not enter into a contract with a company for goods and services unless the contract contains a written verification from the company that it: (1) does not boycott Israel; and (2) will not boycott Israel during the term of this contract.

Sample Wording: "Respondent _____ hereby acknowledges the Prohibition of Contracts with Foreign Terrorist Organizations and with the Boycotting of Israel. The signatory executing this contract on behalf of company hereby verifies that the company is not on the Texas Comptroller's list of terrorist organizations, is not engaged in business with Iran, Sudan or any foreign terrorist organization and will not boycott Israel throughout the term of this contract." (to be submitted on company letterhead with authorized signor(s) signature(s).

1.18 HOUSE BILL (H.B.) 1295 – "DISCLOSURE OF INTERESTED PARTIES"

In 2015, the Texas Legislature adopted House Bill 1295 (H.B. 1295) has been revised. *Portions of the text of subsection as amended by Acts 2017, 85th R.S., Ch. 526 (SB 255).*

(Changes identified by italicized text apply only to a contract entered into or amended on or after January 1, 2018).

(a) In this section:
- (1) "Business entity" means any entity recognized by law through which business is conducted, including a sole proprietorship, partnership, or corporation.
- (2) "Governmental entity" means a municipality, county, public school district, or special-purpose district or authority.
- (3) "Interested party" means a person who has a controlling interest in a business entity with whom a governmental entity or state agency contracts or who actively participates in facilitating the contract or negotiating the terms of the contract, including a broker, intermediary, adviser, or attorney for the business entity.
- (4) "State agency" means a board, commission, office, department, or other agency in the executive, judicial, or legislative branch of state government. The term includes an institution of higher education as defined by Section 61.003, Education Code.

(b) This section applies only to a contract of a governmental entity or state agency that:
- (1) requires an action or vote by the governing body of the entity or agency before the contract may be signed; or
- (2) has a value of at least $1 million.

(c) Notwithstanding Subsection (b), this section does not apply to:
- *(1) a sponsored research contract of an institution of higher education;*
- *(2) an interagency contract of a state agency or an institution of higher education;*
- *(3) a contract related to health and human services if:*
  - *(A) the value of the contract cannot be determined at the time the contract is executed; and*
  - *(B) any qualified vendor is eligible for the contract;*
- *(4) a contract with a publicly traded business entity, including a wholly owned subsidiary of the business entity;*
- *(5) a contract with an electric utility, as that term is defined by Section 31.002, Utilities Code; or*
- *(6) a contract with a gas utility, as that term is defined by Section 121.001, Utilities Code.*

(d) A governmental entity or state agency may not enter into a contract described by Subsection (b) with a business entity unless the business entity, in accordance with this section and rules adopted under this section, submits a disclosure of interested parties to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency.

(e) The disclosure of interested parties must be submitted on a form prescribed by the Texas Ethics Commission that includes:
- *(1) a list of each interested party for the contract of which the contracting business entity is aware; and*
- *(2) a written, unsworn declaration subscribed by the authorized agent of the contracting business entity as true under penalty of perjury that is in substantially the following form:*

"My name is _____, my date of birth is _____, and my address is

_____, _____, _____, _____,
(Street) (City) (State) (Zip Code)

_____.
(Country)

I declare under penalty of perjury that the foregoing is true and correct. Executed in _____ County, State of _____, on the _____ day of _____, _____.
(Month) (Year)

_____
Declarant".

(f) Not later than the 30th day after the date the governmental entity or state agency receives a disclosure of interested parties required under this section, the governmental entity or state agency shall submit a copy of the disclosure to the Texas Ethics Commission.

(g) The Texas Ethics Commission shall adopt rules necessary to implement this section, prescribe the disclosure of interested parties form, and post a copy of the form on the commission's Internet website.

Added by Acts 2015, 84th Leg., R.S., Ch. 1024 (H.B. 1295), Sec. 3, eff. September 1, 2015. Amended by Acts 2017, 85th Leg., R.S., Ch. 526 (SB 255, Sec. 5, eff. September 1, 2017).

https://www.ethics.state.tx.us/tec/1295-Info.htm
https://www.ethics.state.tx.us/whatsnew/FAQ_Form1295.html
https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

As a business entity under this law, it is your firm's responsibility to comply with all disclosure laws including Chapter 2252. The City of Pharr as the governmental entity must ensure compliance of the same.

Note: You will be required to register and create an account. Once registered, you will receive an email containing a password setup link. Click on the link to set your password. After you have established an account, you will use your email address, password, and user type (Business Entity) to log in to the filing application to enter the required information on Form 1295. Print a copy of the completed form which includes a unique certification of filing number assigned by the application. The completed Form 1295 with an "unsworn declaration" certification with signature must be submitted at the time the signed contract is submitted to the City of Pharr. Failure to comply may result in contract revocation and award to the next compliant contractor/vendor.

PART 2 P R O D U C T S - Not Used
PART 3 E X E C U T I O N – Not Used

END OF SECTION

DOCUMENT 00 22 13
SUPPLEMENTARY INSTRUCTIONS TO RESPONDENTS

1.1 INSTRUCTIONS TO RESPONDENTS

A. Instructions to Respondents for Project consist of the following:

1. AIA Document A701, "Instructions to Respondents".
2. The following Supplementary Instructions to Respondents that modify and add to the requirements of the Instructions to Respondents.

1.2 SUPPLEMENTARY INSTRUCTIONS TO RESPONDENTS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Respondents." Where a portion of the Instructions to Respondents is modified or deleted by these Supplementary Instructions to Respondents, unaltered portions of the Instructions to Respondents shall remain in effect.

1.3 ARTICLE 2 - RESPONDENT'S REPRESENTATIONS

1. 2.1.3.1 - The Respondent has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted proposal the cost of such fees, permits, and requirements not otherwise indicated as provided by City of Pharr.

2. 2.1.5 - The Respondent is a properly licensed Contractor according to the laws and regulations of State of Texas and meets qualifications indicated in the Procurement and Contracting Documents.

3. 2.1.6 - The Respondent has incorporated into the Proposal adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - SOLICITATION DOCUMENTS

A. 3.4 - Addenda:

3.4.3 - Addenda may be issued up to four (4) days prior to the receipt of proposals.

1. Add Section 3.4.4.1:

a. 3.4.4.1 – The City of Pharr may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Proposal indicates that the Proposal, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.

2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of the City of Pharr, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 – PROPOSAL SUBMITTAL PROCEDURES

A. 4.1 - Preparation of Proposals:

a. 4.1.1.1 - Printable electronic Proposal Forms and related documents are available from a downloadable link. Plans, Specifications, Proposal Forms, and Contract Documents may be viewed electronically and downloaded by visiting our website at http://pharr.procureware.com/.

b. 4.1.9 – The City of Pharr may elect to disqualify a proposal due to failure to submit a proposal on the form(s) requested, failure to respond to requested alternates or unit prices, failure to complete entries in all blanks in the Proposal Form, or inclusion by the Respondent of any alternates, conditions, limitations or provisions not called for.

c. 4.1.10 **–** The City of Pharr shall be exempt from sales taxes. The City of Pharr shall provide sales tax exemption certificate upon project award.

B. 4.3 - Submission of Proposals:

a. 4.3.1.2 - Include Respondent's Contractor License Number applicable in Project jurisdiction on the face of the sealed proposal envelope.

C. 4.4 - Modification or Withdrawal of Proposals:

a. 4.4.2.1 - Such modifications to or withdrawal of a proposal may only be made by persons authorized to act on behalf of the Respondent. Authorized persons are those so identified in the Respondent's corporate bylaws, specifically empowered by the Respondent's charter or similar legally binding document acceptable to the City of Pharr, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to the City of Pharr at the time of seeking modifications or withdrawal of the Proposal.

b. 4.4.2.2 – The City of Pharr will consider modifications to a proposal written on the sealed proposal envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from

the Proposal; the amount of the Proposal itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed proposal form, awaiting final figures from the Respondent, does not require power of attorney due to the evidenced authorization of the Respondent implied by the circumstance of the completion and delivery of the Proposal.

D. 4.5 - Break-Out Pricing Proposal Supplement:

1. Provide detailed cost breakdowns at the time of Proposal submittal.

E. 4.6 - Subcontractors, Suppliers, and Manufacturers List Proposal Supplement:

1. Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products at the time of Proposal submittal. Include those subcontractors, suppliers, and manufacturers providing work totaling three (3%) percent or more of the Proposal amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

ARTICLE 5 - CONSIDERATION OF PROPOSALS

F. 5.2 - Rejection of Proposals:

a. The City of Pharr reserves the right to reject a proposal based on the City of Pharr's and Architect's evaluation of qualification information submitted following opening of proposals. The City of Pharr's evaluation of the Respondent's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Respondent's proposed Project staff and proposed subcontractors.

1.6 ARTICLE 6 – POST PROPOSAL INFORMATION

A. 6.1 - Contractor's Qualification Statement:

a. 6.1.1 - Submit “Contractor's Qualification Statement”, Form AIA Document A305-1986 with the Proposal.

1.7 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100% (percent) of the Contract Sum. Refer Notice to Respondents.

B. 7.2 - Time of Delivery and Form of Bonds:

a. The Respondent shall deliver the required bonds to the City of Pharr upon acceptance of their proposal; execute such contractual documents as may be required within the time specified. The City of Pharr may deem the failure of the Respondent to deliver required bonds within the period of time allowed a default.

b. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.8 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA 101 Forms, Owner/Contractor Agreement-Stipulated Sum to be provided and filled out by General Contractor.

1.9 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within ten (10) days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the executed contracts to the City of Pharr in such number of counterparts as the City of Pharr may require.

2. 9.1.2 – The City of Pharr may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.

3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement or the date that the Respondent is obligated to deliver the executed Agreement.

4. 9.1.4 - In the event of a default, the City of Pharr may declare the amount of the Proposal security forfeited and elect to either award the Contract to the next responsible respondent or re-advertise for proposals.

END OF DOCUMENT

DOCUMENT 00 25 13
PRE-PROPOSAL CONFERENCE

1.1 PREBID MEETING

A. Owner and Architect, will conduct a Pre-Proposal Conference as indicated below:

1. Pre-Bid Meeting Date: Thursday, June 27, 2019

2. Meeting Time: 4:00 p.m., local time.

3. Location: In the City Commission Room (2nd floor) of City of Pharr City Hall.

B. Attendance:

1. Prime Respondents: Attendance at Pre-Proposal Conference are encourage to be in attendance.

2. Subcontractors: Attendance is recommended.

3. Notice: Competitive Sealed Proposals will only be accepted from prime bidders.

C. Respondents Questions: Submit written questions to be addressed at Pre-Proposal Conference minimum of four (4) business days prior to meeting.

D. Agenda: Pre-Proposal Conference agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:

a. Advertisement for Bids.

b. Instructions to Bidders.

c. Insurance.

d. Bid Security.

e. Bid Form and Attachments.

f. Bid Submittal Requirements.

g. Bid Submittal Checklist.

h. Notice of Award.

2. Communication during Bidding Period:
    a. Obtaining documents.
    b. Access to Project Web site.
    c. Bidder's Requests for Information.
    d. Bidder's Substitution Request/Prior Approval Request.
    e. Addenda.
3. Contracting Requirements:
    a. Agreement.
    b. The General Conditions.
    c. The Supplementary Conditions.
    d. Other Owner requirements.
4. Construction Documents:
    a. Scopes of Work.
    b. Temporary Facilities.
    c. Use of Site.
    d. Work Restrictions.
    e. Alternates and Allowances.
    f. Substitutions following award.
5. Separate Contracts:
    a. Work by Owner.
    b. Work of Other Contracts.
6. Schedule:
    a. Project Schedule.
    b. Contract Time.
    c. Liquidated Damages.

d. Other Bidder Questions.

7. Site visit.

8. Post-Meeting Addendum.

E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT

DOCUMENT 00 26 00
PROCUREMENT SUBSTITUTION PROCEDURES

1.10 DEFINITIONS

A. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 25 00 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.11 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.12 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a proposal, the Respondent represents that its proposal is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Respondents are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by the City of Pharr when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.

3. The request is fully documented and properly submitted.

1.13 SUBMITTALS

A. Procurement Substitution Request: Submit to The Warren Group Architects, Inc. Procurement Substitution Request must be made in writing by prime contract Respondent only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than three (3) days prior to date of proposal opening.
2. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.

b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.

2) Copies of current, independent third-party test data of salient product or system characteristics.

3) Samples where applicable or when requested by Architect.

4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from City of Pharr Ordinances.

7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the City of Pharr and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.

d. Respondent, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all respondents of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during the solicitation process does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT

SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ _____ Article/Paragraph: _____

Proposed Substitution: _____

_____ Manufacturer:

_____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

Form Version: January 2013
CSI Form 1.5C

SECTION 00 30 00
COMPETITVE SEALED PROPOSAL FORM

CITY OF PHARR/ PSJA
AQUATIC FACILITY

Project No. 1819-35-510-C011-051

PROPOSAL OPENING DATE
Thursday, July 11, 2019 at 3:00 P.M. CST

CITY OF PHARR

We have carefully examined the Plans and Specifications herein referred to and have carefully examined the locations, conditions, and classes of materials of the proposed work; and agree that we will provide all the necessary labor, machinery, tools, apparatus, and other means of construction, and will do all the work and furnish all the materials called for in the Solicitation Documents and Specifications in the manner prescribed and according to the requirements therein set forth.

It is further agreed that the quantities of work to be done at unit prices and materials to be furnished may be increased or diminished as may be considered necessary, in the opinion of the *(Architect or Engineer)*, to complete the work fully as planned and contemplated, and that quantities of work, whether increased or decreased are to be performed at the unit prices set forth below or as provided in the Specifications.

It is further agreed that the lump sum prices may be increased to cover additional work ordered by the *(Architect or Engineer)* and approved by the OWNER, but not shown on the Plans or required by the Specifications, in accordance with the provisions of the General Conditions. Similarly, they may be decreased to cover deletion of work so ordered.

Accompanying this proposal is a certified or cashier's check or proposal bond payable to the City of Pharr.

Dollars ($_____)

Percent (_____%) Time of Completion (_____)

The proposal security accompanying this proposal shall be returned to the respondent, unless in case of the acceptance of the proposal, the respondent shall fail to execute a Contract and file a performance and payment bond within ten (10) days after its acceptance, in which case the proposal security shall become the property of City of Pharr and shall be considered as payment for damages due to delay and other inconveniences suffered by the CITY OF PHARR on account of such failure of the respondent. It is understood that the CITY OF PHARR reserves the right to reject any and all proposals.

PROPOSAL

Respondent agrees to perform all work described in the specifications and shown on the plans, for the following price or prices (Add separate price for Base Proposal, Alternates and Allowances as shown):

ITEM NO.	DESCRIPTION	UOM	QTY	UNIT PRICE
1	BASE PROPOSAL (WITH ALLOWANCES) REFER ALLOWANCE FORM SECTION 00 43 21	LS	1	ENTER BASE PROPOSAL PRICE IN BIDDING PORTAL
2	ALTERNATE 1- REFER ALTERNATES FORM SECTION 00 43 23	LS	1	ENTER ALTERNATE PRICE IN BIDDING PORTAL
3	ALTERNATE 2 REFER ALTERNATES FORM SECTION 00 43 23	LS	1	ENTER ALTERNATE PRICE IN BIDDING PORTAL
4	ALTERNATE 3 REFER ALTERNATES FORM SECTION 00 43 23	LS	1	ENTER ALTERNATE PRICE IN BIDDING PORTAL
5	ALTERNATE 4 REFER ALTERNATES FORM SECTION 00 43 23	LS	1	ENTER ALTERNATE PRICE IN BIDDING PORTAL

*NOTE: Amount shall be shown in both written and figure form. In case of discrepancy between the written amount and the figure, the written amount will govern.

1. BASE PROPOSAL (WITH ALLOWANCES):

_____DOLLARS

($_____)

Alternate 1_____DOLLARS

($_____)

Alternate 2_____DOLLARS

($_____)

Alternate 3_____DOLLARS

($_____)

Alternate 4_____DOLLARS

($_____)

In the event of the award of a Contract to the undersigned, the undersigned will furnish a performance and payment bond for the full amount of the Contract, to secure proper compliance with the terms and

provisions of the Contract, to insure and guarantee payment of all lawful claims for labor performed and materials furnished in the fulfillment of the Contract.

The proposed work to be done shall be accepted when fully completed and finished in accordance with the Plan and Specifications to the satisfaction of the *(Architect or Engineer)*. The undersigned certifies that the proposal prices contained in this Proposal have been carefully checked and are submitted as correct and final.

The Respondent agrees that this proposal shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing for receiving proposals.

Unit and lump sum prices must be shown in figures for each item listed in the Proposal. Should proposal prices on any item be omitted, the right is reserved to apply the lowest prices submitted by and other respondents for the omitted items in payment for work done under this Proposal. In the event of discrepancies, respondent agrees that the Owner has the right to accept or reject any or all proposals and to waive any or all formalities and/or technicalities.

2. SUBCONTRACTORS AND SUPPLIERS

D. A. The following companies shall execute subcontracts for the portions of the Work indicated:

1. General Conditions:

_____.

2. Site Work:

_____.

3. Concrete Scope:

_____.

4. Masonry Scope:

_____.

5. Structural Steel Work:

_____.

6. Carpentry:

_____.

7. Thermal & Moisture Protection Scope:

_____.

8. Doors, Windows, Glass & Hardware Work:

   _____.

9. Painting (Finishes) Work:

   _____.

10. Miscellaneous/Specialties:

    _____.

11. Mechanical/Plumbing Work:

    _____.

12. Electrical Work:

    _____.

13. Roofing:

    _____.

14. Fire Protection Work:

    _____.

2. TIME OF COMPLETION

   Coordinate location of Contract Time requirement with option in paragraph below.
   The undersigned Respondent proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work within _____(_____) calendar days.

3. Receipt is hereby acknowledged of the following addenda to the Contract Document:

   Addendum No. 1 dated:_____ Received:_____

   Addendum No. 2 dated:_____ Received:_____

   Addendum No. 3 dated:_____ Received:_____

   Addendum No. 4 dated:_____ Received:_____

   Addendum No. 5 dated:_____ Received:_____

5. PROPOSAL SUPPLEMENTS
The following supplements are a part of this Proposal Form and are attached hereto.

A. Proposal Form Supplement - Instructions to Respondents.
B. Proposal Form Supplement - CSI Form 1.5C Substitution Request

1.14 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in the State of Texas and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

Date:_____

Respectfully Submitted:

_____
Authorized Signor

_____
Type/Print Name (Authorized Signor)

_____
Title

_____
Legal Company Name

(Seal - If respondent is a Corporation)

_____
Address

_____
City, State, Zip

_____
Business Phone

_____
Cell Number

_____
E-Mail Address

END OF DOCUMENT

DOCUMENT 00 31 32
GEOTECHNICAL REPORT

1.1 GEOTECHNICAL DATA

B. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide City of Pharr's information for Respondents' convenience and are intended to supplement rather than serve in lieu of Respondents' own investigations. They are made available for Respondents' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

C. A Supplemental Recommendations to Geotechnical Engineering Study Proposed City of Pharr/PSJA Aquatics Facility project, prepared by Raba Kistner, Inc. dated April 12, 2019.

D. Related Requirements:

1. Document 00 21 00 "Instructions to Respondents" for the Respondent's responsibilities for examination of Project site and existing conditions.

RABA KISTNER
Building Better Tomorrows
800 East Hackberry
McAllen, TX 78501
www.rkci.com

P 956.682.5332
F 956.682.5487
Toll Free 800.316.4912
TBPE Firm F-3257

Project No. AMA19-006-01
April 12, 2019

Mr. Omar Anzaldua, Jr., P.E., CFM, PMP
City Engineer
City of Pharr
118 S. Cage Boulevard
Pharr, Texas 78577

RE: Supplemental Recommendations to Geotechnical Engineering Study
Proposed City of Pharr Aquatic Facility
Near the Northwest Corner to the Intersection of
W. Sioux Road and U.S. Expressway 281
Pharr, Hidalgo County, Texas

Dear Mr. Anzaldua:

RABA KISTNER Consultants, Inc. (RKCI) is pleased to submit this letter providing supplemental recommendations to our original geotechnical engineering study for the above-referenced project (**RKCI** Project No. AMA19-006-00, dated March 6, 2019). This supplemental letter includes the logs of the additional borings, a brief summary of the field data obtained during this supplemental field exploration, an interpretation of our findings, and the deep foundation design and construction recommendations for the proposed aquatic building to be located at the above-referenced project site. This additional study was performed in accordance with **RKCI** Proposal No. PMA19-010-00b, dated March 7, 2019. Written authorization to proceed with this study was received by our office via electronic-mail attachment on Monday, April 1, 2019.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the subject site were evaluated by conducting two borings as shown in the following table:

Proposed Structure	Number of Borings	Depth, ft.*	Boring Identification
Aquatic Building	1	80	B-101
	1	60	B-102

* below the ground surface elevations existing at the time of our study

The borings (designated as "B-") were drilled on April 2 and April 4, 2019, at the locations shown on the Boring Location Map, Figure 1. The boring locations are approximate and were located in the field by an **RKCI** representative based on the boring location map titled "City of Pharr - Aquatic Facility," provided to

us by Ms. Maria Rangel, EIT with the City of Pharr (CLIENT) via electronic-mail attachment on March 27, 2019. The borings were conducted utilizing straight flight augers and were backfilled with the auger cuttings following completion of each day's drilling operations. During each day's drilling operations, Split-Spoon (with Standard Penetration Test, SPT) and Shelby Tube (ST) samples were collected.

The SPT and ST samples were obtained in accordance with accepted standard practices and the penetration test results are presented as "blows per foot" on the boring logs. Representative portions of the samples were sealed in containers to reduce moisture loss, labeled, packaged, and transported to our laboratory for subsequent testing and classification.

In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff in general accordance with the Unified Soil Classification System (USCS). The geotechnical engineering properties of the strata were evaluated by the following laboratory tests: natural moisture content, Atterberg limits, unconfined compressive strength tests, dry unit weight determinations, and percent passing a No. 200 sieve determinations.

The results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 and 3. A key to the classification of terms and symbols used on the logs is presented on Figure 4. The results of the laboratory and field testing are also tabulated on Figure 5 for ease of reference.

SPT results are noted as "blows per foot" on the boring logs and on Figure 5, where "blows per foot" refers to the number of blows required for a falling 140-pound (lb.) hammer to penetrate 12 inches into the subsurface materials. Where hard or very dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved.

Samples will be retained in our laboratory for 30 days after submittal of this supplemental letter. Other arrangements may be provided at the written request of the CLIENT.

STRATIGRAPHY

The subsurface stratigraphy within the proposed aquatic building was encountered to be similar to the soils encountered in original geotechnical engineering study (**RKCI** Project No. AMA19-006-00, dated March 6, 2019). The stratigraphy consisted of loose to hard, fat clay soils and lean clay soils, underlain by very dense, silty sand soils. Consequently, the individual boring logs should be consulted for detailed stratigraphic information at the individual boring locations. The lines designated the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

GROUNDWATER

Groundwater was encountered during our drilling operations in the borings at a depth of about 20 ft each below the ground surface elevation existing at the time of our study. The boreholes were left open for the duration of the field exploration phase to allow monitoring of water levels. It is possible for groundwater to exist beneath this site on a transient basis following periods of precipitation. Fluctuations in

groundwater levels occur due to variations in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level.

Based on the findings in the borings, we believe that groundwater seepage encountered during site earthwork activities and shallow foundation construction may be controlled using temporary earthen berms and conventional sump-and-pump dewatering methods. For deep foundation excavations, this could include the use of slurry drilling and/or temporary casing (including overdrive techniques) to reduce groundwater seepage and sloughing of the subsurface soils.

DEEP FOUNDATION RECOMMENDATIONS

Drilled, straight-shaft piers may be considered to support the proposed aquatic building. We recommend that piers extend to a minimum depth of 30 ft below the ground surface elevation existing at the time of our study or below final ground surface, whichever is greater. The piers may be designed as both end bearing units and as friction units utilizing the maximum allowable end-bearing pressures and the allowable side shear resistance values tabulated in the following tables.

Approximate Depth Range (ft) *	Maximum Allowable End-Bearing Pressure (ksf)
12 to 15	7.0
16 to 20	4.8
21 to 25	9.5
26 to 44	9.0
45 to 59	15.0
60 to 70	17.0

*below the ground surface elevations existing at the time of our study.

Approximate Depth Range (ft) *	Allowable Side Shear Resistance (ksf)
0 to 8	0
8 to 15	0.60
15 to 20	0.40
20 to 45	0.80
45 to 60	1.35
60 to 70	1.40

*below the ground surface elevations existing at the time of our study.

The side shear resistance values presented above should be used for the portion of the shaft extending below a depth of 8 ft. If the drilled, straight-shaft piers are designed as both end bearing units and as friction units, the side shear resistance value should be neglected along the portion of the shaft located one shaft diameter from the bottom of the pier, in order to proportion the drilled piers for axial compression. The allowable values for end bearing and side shear resistance were evaluated using factors of safety of 3 and 2, respectively, with respect to the measured soil shear strength. Based on the 80-ft maximum depth of exploration, pier depths should not exceed a depth of 70 ft below the ground surface elevations existing at the time of our study.

Due to the presence of groundwater, the use of slurry drilling techniques and/or temporary casing should be anticipated for the construction of the drilled piers. Consequently, slightly deeper piers may be required to accommodate for the casing procedures.

PIER SHAFTS

The pier shafts will be subjected to potential uplift forces if the surrounding expansive soils within the active zone are subjected to alternate drying and wetting conditions. The maximum potential uplift force acting on the shafts may be estimated by:

$F_u = 30 * D$ (considering the existing soil conditions)

$F_u = 17 * D$ (considering the implementation of the site improvement to reduce the estimated PVR related values to about 3/4 inch)

where:

F_u = uplift force in kips; and
D = diameter of the shaft in feet.

It is recommended that the pier shafts be a minimum of 24 inches in diameter to facilitate reinforcing steel placement and shaft observation prior to placing concrete.

ALLOWABLE UPLIFT RESISTANCE

Resistance to uplift forces exerted on the drilled, straight-shaft piers will be provided by the sustained compressive axial force (dead load) plus the allowable uplift resistance provided by the soil. The resistance provided by the soil depends on the shear strength of the soils adjacent to the pier shaft and below the depth of the active zone. The allowable uplift resistance values provided by the soils at this site are tabulated on the following table. These values were evaluated using a factor of safety of 2.

Approximate Depth Range* (ft)	Allowable Uplift Resistance (ksf)
0 to 8	0
8 to 15	0.40
15 to 20	0.25
20 to 45	0.50
45 to 60	0.90
60 to 70	0.93

*below the ground surface elevations existing at the time of our study.

Reinforcing steel will be required in each pier shaft to withstand a net force equal to the uplift force minus the uplift resistive force and the sustained compressive load carried by the pier. We recommend that each pier be reinforced to withstand this net force or an amount equal to 1 percent of the cross-sectional area of the shaft, whichever is greater.

PIER SPACING

Where possible, we recommend that the piers be spaced at a center-to-center distance of at least three shaft diameters. Such spacing will not require a reduction in the load carrying capacity of the individual piers.

If design and/or construction restraints require that piers be spaced closer than the recommended three shaft diameters, **RKCI** must re-evaluate the allowable bearing capacities presented above for the individual piers. Reductions in load carrying capacities may be required depending upon individual loading and spacing conditions.

GRADE BEAMS

For the structure being considered, we recommend that the grade beams interconnecting the piers be ground-supported on properly-compacted, suitable select fill materials, but designed to span the piers.

FLOOR SLABS

For the structure being considered, the floor slabs may be ground supported on properly-compacted, suitable, select fill materials, provided that the anticipated movements discussed under the *Expansive Soil-Related Movements* section of our original geotechnical engineering report (**RKCI** Project No. AMA19-006-00, dated March 6, 2019) will not impair the performance of the floor, frame, or roof systems.

LATERAL RESISTANCE

Resistance to lateral loads and the expected pier behavior under the applied loading conditions will depend not only on the subsurface conditions, but also on the loading conditions, the pier type and size(s), and the engineering properties of the pier. Once the structural loadings are known, as well as the pier sizes and properties, the piers should be analyzed to determine the resulting lateral deflections, maximum bending moments, and ultimate bending moments. This type of analysis is typically performed utilizing a computer analysis program and usually requires a trial and error procedure to appropriately size the piers and meet project tolerances.

To assist the design engineer in this procedure, we are providing the soil parameters tabulated in the table shown below for use in analysis. These parameters are in accordance with the input requirements of one of the more commonly used computer programs for laterally-loaded piles, the "L-Pile Plus" program. If a different program is used for analysis, different parameters may be required and different limitations may be required than what was assumed in selecting the parameters given on the table tabulated below. Thus, if a program other than "L-Pile Plus" is used, **RKCI** must be notified of the analysis method and the required soil parameters, so that we can review and revise our recommendations, if required.
The soil-related parameters required for input into the "L-Pile Plus" program are summarized in the following table:

Soil Type	Approximate Depth Range (ft) *	c, tsf	ϕ (°)	ε_{50}	k_s, (pci)	k_c, (pci)	γ, (pcf)
Clay Soils (Above the Groundwater Table)	0 to 15	1.2	--	0.005	1,000	400	120
Clay Soils (Above the Groundwater Table)	15 to 20	0.8	--	0.007	500	200	115
Clay Soils (Below the Groundwater Table)	20 to 45	1.5	--	0.005	1,000	4000	57
Clay Soils (Below the Groundwater Table)	45 to 70	2.75	--	0.004	2,000	8000	67

* Below the ground surface elevation existing at the time of our study.

Where:

c = undrained shear strength
ϕ = angle of internal friction
ε_{50} = strain at 50 percent
k_s = horizontal modulus of subgrade reaction (static)
k_c = horizontal modulus of subgrade reaction (cyclic)
γ = density (effective unit weight)

The values presented on the previous table for subgrade modulus are based on recommended values for the "L-Pile Plus" computer program for the strength of the subsurface conditions encountered in the borings, and are not necessarily based on laboratory test results.

The parameters presented previously **do not** include factors of safety. Consequently, it is recommended that a factor of safety of at least 2 be introduced to the analysis by doubling the applied lateral loads and moments.

FOUNDATION CONSTRUCTION CONSIDERATIONS

DRILLED PIERS

Drilled pier excavations must be examined by an **RKCI** representative who is familiar with the geotechnical aspects of the subsurface stratigraphy, the structural configuration, foundation design details, and assumptions prior to placing concrete. This is to observe that:

- The shaft has been excavated to the specified dimensions at the correct depth established by the previously mentioned criteria;
- The shaft has been drilled plumb within specified tolerances along its total length; and
- Excessive cuttings, buildup and soft, compressible materials have been removed from the bottom of the excavation.

Drilled pier excavation observations should be scheduled with the Geotechnical Engineer a minimum of 48 hours prior to pier drilling. Failure to do so will be the responsibility of the General Contractor.

REINFORCEMENT AND CONCRETE PLACEMENT

Reinforcing steel should be checked for size and placement prior to concrete placement. Placement of concrete should be accomplished as soon as possible after excavation to reduce changes in the moisture content or the state of stress of the foundation materials. Concrete should not be placed in the pier excavations without the approval of the Engineer. No foundation element should be left open overnight without concreting.

TEMPORARY CASING

Groundwater was observed during drilling operations at a depth of about 20 ft below the ground surface elevations existing at the time of our study. Therefore, groundwater seepage and/or side sloughing will be encountered during pier construction at this site depending on climatic conditions. Therefore, we recommend that the bid documents require the foundation contractor to specify unit costs for different lengths of casing and/or slurry drilling techniques which will be required.

WET WEATHER CONDITIONS

Earthwork contractors should be made aware of the moisture sensitivity of the near surface soils and potential compaction difficulties. If construction is undertaken during wet weather conditions, the surficial soils may become saturated, soft, and unworkable. Drainage trenches within the soils to be excavated, reworked and/or recompacted may be required. Additionally, subgrade stabilization techniques, such as chemical (cement, flyash or hydrated lime) treatment, may be required to provide a more weather-resistant working surface during pad construction. Therefore, we recommend that consideration be given to construction during the dryer months. Alternatively, the contractor should protect all exposed areas once topsoil has been stripped, as well as provide positive drainage during earthwork operations.

All other recommendations and limitations remain as stated in our original geotechnical engineering report (**RKCI** Project No. AMA19-006-00, dated March 6, 2019).
We trust that this supplemental information will be helpful to the design team. If you should have any comments or questions pertaining to this matter of if we may be of additional assistance, please do not hesitate to call.

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

Saul Cruz, EIT
Graduate Engineer

Katrin M. Leonard, P.E.
Associate

SC/KML

Copies Submitted: Above (1)
The Warren Group Architects Inc. (1)
Solorio, Inc. (1)

= Borings conducted for this study.

= Borings conducted for the Geotechnical Engineering Study for RKCI Project No AMA19-006-00, dated March 6, 2019.

RABA KISTNER CONSULTANTS
Engineering • Testing • Environmental
Forensic • Infrastructure
800 E. Hackberry Avenue
McAllen, Texas 78501
(956)682-5332 TEL
(956)682-5487 FAX
www.rkci.com
TBPE Firm F-3257

BORING LOCATION MAP
PROPOSED CITY OF PHARR AQUATIC FACILITY

NWC OF W. SIOUX ROAD & U.S. EXPRESSWAY 281
PHARR, HIDALGO COUNTY, TEXAS

REVISIONS

No.	DATE	DESCRIPTION

PROJECT No.:	AMA19-006-01
ISSUE DATE:	04-10-19
DRAWN BY:	DV
CHECKED BY:	SC
REVIEWED BY:	KML

FIGURE
1

LOG OF BORING NO. B-101

Prop. City of Pharr Aquatic Facility-Additional
NWC of W. Sioux Road & U.S. Expressway 281
Pharr, Hidalgo County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: Existing Grade, ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**LEAN CLAY with SAND (CL)** firm to stiff, dark brown, with roots extending down to a depth of about 2 ft	7			22	
				14				76
5			**SANDY FAT CLAY (CH)** very stiff, brown, with calcareous nodules	26			33	
				28				64
10			**FAT CLAY with SAND (CH)** very stiff to firm, brown, with black ferrous stains	19				
15					109		38	
20				5				74
25			**FAT CLAY (CH)** very stiff to hard, light brown to brown	29			34	
30				24				
35				27				
40				18				

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	79.8 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA19-006-01
DATE DRILLED:	4/2/2019	**DATE MEASURED:**	4/2/2019	**FIGURE:**	2a

LOG OF BORING NO. B-101

Prop. City of Pharr Aquatic Facility-Additional
NWC of W. Sioux Road & U.S. Expressway 281
Pharr, Hidalgo County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: Existing Grade, ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT; WATER CONTENT; LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
50			**FAT CLAY (CH)** very stiff to hard, light brown to brown *(continued)*	32				
				38				
55				42				
60				45				
65			- with gravel below a depth of about 65 ft	50/ 11"				
70				50/ 11"				
75			**SILTY SAND with GRAVEL (SM)** dense to very dense, dark brown	45				
				50/ 10"				
80			Boring terminated at a depth of about 79.8 ft. NOTES: During the drilling operations, groundwater was encountered at a depth of about 20 ft.					
85								

DEPTH DRILLED:	79.8 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA19-006-01
DATE DRILLED:	4/2/2019	**DATE MEASURED:**	4/2/2019	**FIGURE:**	2b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-102

Prop. City of Pharr Aquatic Facility-Additional
NWC of W. Sioux Road & U.S. Expressway 281
Pharr, Hidalgo County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: Existing Grade, ft	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
0			**SANDY FAT CLAY (CH)** firm to hard, dark brow, with roots extending down to a depth of about 2 ft	7	116	8.00	32	60
5			**FAT CLAY with SAND (CH)** hard to very stiff to hard, brown, with calcareous nodules	30	114		37	72
10				19				
15								
20			**LEAN CLAY with SAND (CL)** firm to very stiff, brown	4			18	
25				20				
30			**FAT CLAY (CH)** very stiff to hard, light brown to brown	26				
35				28				
40			- with black ferrous stains below a depth of about 40 ft	42				

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	60.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA19-006-01
DATE DRILLED:	4/4/2019	**DATE MEASURED:**	4/4/2019	**FIGURE:**	3a

LOG OF BORING NO. B-102

Prop. City of Pharr Aquatic Facility-Additional
NWC of W. Sioux Road & U.S. Expressway 281
Pharr, Hidalgo County, Texas

RABA KISTNER
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT^2	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: Existing Grade, ft			0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0		
						PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT		
						10 20 30 40 50 60 70 80		
			FAT CLAY (CH) very stiff to hard, light brown to brown *(continued)*	44				
50				44				
55			- with olive clay lenses below a depth of about 55 ft	40				
				44				
60			Boring terminated at a depth of about 60 ft.					
65			NOTES: During the drilling operations, groundwater was encountered at a depth of about 20 ft.					
70								
75								
80								
85								

DEPTH DRILLED:	60.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA19-006-01
DATE DRILLED:	4/4/2019	**DATE MEASURED:**	4/4/2019	**FIGURE:**	3b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS


CALCAREOUS


CALICHE


CLAY


CLAYEY


GRAVEL


GRAVELLY


PEAT


SAND


SANDY


SILT


SILTY


FILL

ROCK TERMS


CHALK


CLAYSTONE


CLAY-SHALE


CONGLOMERATE


DOLOMITE


IGNEOUS


LIMESTONE


MARL


METAMORPHIC


SANDSTONE


SHALE


SILTSTONE

OTHER


ASPHALT


BASE


CONCRETE/CEMENT


BRICKS / PAVERS


WASTE


NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS


BLANK PIPE


SCREEN


BENTONITE


CEMENT GROUT


BENTONITE & CUTTINGS


CONCRETE/CEMENT


CUTTINGS


GRAVEL


SAND


VOLCLAY

SAMPLE TYPES


AIR ROTARY


GRAB SAMPLE


CORE


GEOPROBE SAMPLER


ROTOSONIC -DAMAGED


MUD ROTARY


NO RECOVERY


NX CORE


PITCHER


ROTOSONIC -INTACT


SHELBY TUBE


SPLIT BARREL


SPLIT SPOON


TEXAS CONE PENETROMETER


DISTURBED

STRENGTH TEST TYPES


POCKET PENETROMETER


TORVANE


UNCONFINED COMPRESSION


TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED


TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. AMA19-006-01

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Prop. City of Pharr Aquatic Facility-Additional
NWC of W. Sioux Road & U.S. Expressway 281
Pharr, Hidalgo County, Texas

FILE NAME: AMA19-006-01.GPJ 4/11/2019

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-101	0.0 to 1.5	7	14	41	19	22	CL				
	2.5 to 4.0	14	11						76		
	5.0 to 6.5	26	11	52	19	33	CH				
	7.5 to 9.0	28	14						64		
	10.0 to 11.5	19	17								
	15.0 to 17.0		20	59	21	38	CH	109		2.12	UC
	20.0 to 21.5	5	22						74		
	25.0 to 26.5	29	19	54	20	34	CH				
	30.0 to 31.5	24	22								
	35.0 to 36.5	27	17								
	40.0 to 41.5	18	19								
	45.0 to 46.5	32	19								
	50.0 to 51.5	38	20								
	55.0 to 56.5	42	19								
	60.0 to 61.5	45	20								
	65.0 to 66.4	50/ 11"	16								
	70.0 to 71.4	50/ 11"	10								
	75.0 to 76.5	45	19								
	78.5 to 79.8	50/ 10"	17								
B-102	0.0 to 1.5	7	17						60		
	2.0 to 4.0		14	51	19	32	CH	116		8.00	UC
	5.0 to 6.5	30	12						72		
	7.0 to 9.0		16	59	22	37	CH	114		2.42	UC
	10.0 to 11.5	19	19								
	15.0 to 17.0		21							2.25	PP
	20.0 to 21.5	4	21	34	16	18	CL				
	25.0 to 26.5	20	20								
	30.0 to 31.5	26	24								
	35.0 to 36.5	28	17								
	40.0 to 41.5	42	18								
	45.0 to 46.5	44	20								
	50.0 to 51.5	44	17								
	55.0 to 56.5	40	23								
	58.5 to 60.0	44	18								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic

DOCUMENT 00 43 21
ALLOWANCE FORM

1.15 PROPOSER INFORMATION

A. Respondent: _____.

B. Project Name: City of Pharr/PSJA Aquatic Facility.

C. Project Number: 1819-35-510-C011-051

D. Project Location: 3001 N Cage Blvd., Pharr, Pharr, Texas 78577

E. Owner: City of Pharr, TX
Mr. Alex Meade, City Manager
118 South Cage Blvd.
Pharr, Texas 78577

F. Architect: Laura Warren, AIA/Principal, The Warren Group Architects, Inc., 1801 S. 2nd Street, Suite 330, McAllen, Texas 78503.

G. Architect Project Number: 971805

1.16 PROPOSAL FORM SUPPLEMENT

A. This form is required to be attached to the Proposal Form.

B. The undersigned Respondent certifies that Base Proposal submission to which this Proposal Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 01 21 00 "Allowances."

SUBMISSION OF PROPOSAL SUPPLEMENT

A. Allowance No.1: General Contractor to provide $15,000.00 (Fifteen Thousand U.S. Dollars) for Architectural Design Contingency Allowance.

B. Allowance No.2: General Contractor to provide $70,000.00 (Seventy Thousand U.S. Dollars) for MEP Allowance Commissioning IECC 2015.

C. Allowance No.3: General Contractor to provide $35,000.00 (Thirty Five Thousand U.S. Dollars) for MEP Allowance Test and Balance.

D. Allowance No.4: General Contractor to provide $83,000.00 (Eighty Three Thousand U.S. Dollars) for Structural Allowance of Concrete, Reinforcing Steel, Structural Steel, and CMU. Refer Allowance note on Structural Drawings.

Respectfully submitted this ____ day of _____, 2019.

Submitted By: _____
(Name of Proposing firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF DOCUMENT

DOCUMENT 00 43 23
ALTERNATES FORM

1.17 PROPOSAL INFORMATION

A. Respondent: _____.

B. Prime Contract: _____.

C. Project Name: City of Pharr/PSJA Aquatic Facility

D. Project Location: 3001 N Cage Blvd., Pharr Texas 78577

E. Owner: City of Pharr, TX
Mr. Alex Meade, City Manager
118 South Cage Blvd.
Pharr, Texas 78577

F. Architect: Laura Warren, AIA/Principal, The Warren Group Architects, Inc., 1801 S. 2nd Street, Suite 330, McAllen, Texas 78503.

G. City Project # 1819-35-510-C011-051

H. Architect Project Number: 971805.

1.18 PROPOSAL FORM SUPPLEMENT

A. This form is required to be attached to the Proposal Form.

1.19 DESCRIPTION

A. The undersigned Respondent proposes the amount below be added to or deducted from the Base Proposal if particular alternates are accepted by the City of Pharr. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.
B. If the alternate does not affect the Contract Sum, the Respondent shall indicate "NO CHANGE."
C. If the alternate does not affect the Work of this Contract, the Respondent shall indicate "NOT APPLICABLE."
D. The Respondent shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.
E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within 60 days of the Notice of Award unless otherwise indicated in the Contract Documents.
F. Acceptance or non-acceptance of any alternates by the City of Pharr shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.20 SCHEDULE OF ALTERNATES

A. Alternate No. 1: General Contractor to provide cost for 1,212 S.F. Second level build-out rooms: Private Viewing Room 205, RR 206 and Stairs 168.

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

($_____).

_____Dollars

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

_____ Number calendar days to adjust the Contract Time for this alternate.

B. **Alternate No. 2: General Contractor to provide cost for Endless pool located north of the Diving Well, which will sit on deck and is to be used for Training.**

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

($_____).

_____Dollars

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

_____ Number calendar days to adjust the Contract Time for this alternate.

C. **Alternate No. 3: General Contractor to provide cost for 2 (two) Large LED Scoreboards.**

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

($_____).

_____Dollars

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

_____ Number calendar days to adjust the Contract Time for this alternate.

D. **Alternate No. 4: General Contractor to provide cost for Exterior Digital Display Billboard at Main Entry Monument Sign.**
ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

($_____).

_____Dollars

ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.

_____ Number calendar days to adjust the Contract Time for this alternate.

1.21 SUBMISSION OF PROPOSAL SUPPLEMENT

Respectfully submitted this ____ day of _____, 2019.

Submitted By: _____
(Name of Proposing firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF DOCUMENT

DOCUMENT 00 43 73
PROPOSED SCHEDULE OF VALUES FORM

1.22 PROPOSAL FORM SUPPLEMENT

A. A completed Proposed Schedule of Values form is required to be attached to the Competitive Sealed Proposal Form.

1.23 PROPOSED SCHEDULE OF VALUES FORM

A. Proposed Schedule of Values Form: Provide a breakdown of the proposal amount, including alternates, in enough detail to facilitate continued evaluation of proposal. Coordinate with the Project Manual Table of Contents. Provide multiple line items for principal material and subcontract amounts in excess of five percent of the Contract Sum.

B. General Contractor is to provide a cost breakdown on their own company format to include the following divisions:
01. General Conditions
02. Site Work
03. Concrete
04. Masonry
05. Structural Steel
06. Carpentry
07. Thermal and Moisture Protection
08. Doors, Windows Glass & Hardware Work
09. Painting (Finishes)
10. Miscellaneous/Specialties
11. Mechanical/Plumbing
12. Electrical
13. Roofing Work
14. Fire Protection Work

C. Arrange schedule of values consistent with format of AIA Document G703 Continuation Sheet.

1. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT

DOCUMENT 00 43 93
PROPOSAL SUBMITTAL CHECKLIST

1.24 PROPOSAL INFORMATION

A. Respondent: _____.

B. Prime Contract: _____.

C. Project Name: City of Pharr/ PSJA Aquatic Facility

D. Project Location: 3001 N Cage Blvd., Pharr Texas, 78577

E. Owner: City of Pharr, Mr. Alex Meade, City Manager

F. Owner Project Number: 1819-35-510-C011-051

G. Architect: The Warren Group Architects, Inc., Laura Nassri Warren, AIA/President

H. Architect Project Number: 971805

1.25 RESPONDENT'S CHECKLIST

A. In an effort to assist the Respondent in properly completing all documentation required, the following checklist is provided for the Respondent's convenience. The Respondent is solely responsible for verifying compliance with proposal submittal requirements.

B. Attach this completed checklist to the outside of the Submittal envelope.

- ☐ Used the Proposal Form provided in the Project Manual.
- ☐ Prepared the Proposal Form as required by the Instructions to Respondents.
- ☐ Indicated on the Proposal Form the Addenda received.
- ☐ Attached to the Proposal Form: Proposal Supplement Form - Allowances.
- ☐ Attached to the Proposal Form: Proposal Supplement Form - Alternates.
- ☐ Attached to the Proposal Form: Proposed Schedule of Values Form.
- ☐ Attached to the Proposal Form: <**Insert name of Proposal Form supplement**>.
- ☐ Attached to the Proposal Form: Proposal Bond OR a certified check for the amount required.
- ☐ Proposal envelope shows name and address of the Respondent.
- ☐ Proposal envelope shows the Bidder's Contractor's License Number.
- ☐ Proposal envelope shows name of Project Number and Project name.
- ☐ Proposal envelope shows name of Prime Contract being bid, if applicable.

- ☐ Proposal envelope shows time and day of Proposal Opening.
- ☐ Verified that the Respondent can provide executed Performance Bond and Labor and Material Bond.
- ☐ Verified that the Respondent can provide Certificates of Insurance in the amounts indicated.

END OF DOCUMENT

SECTION 00 45 00
PROPOSAL BOND

PART 1 - GENERAL
PART 2 -
SCHEDULE 0 - SECTION INCLUDES

This section describes the standardized proposal bond form to be submitted with the proposal on the project.

SCHEDULE 1 - REFERENCES – Not Used

SCHEDULE 2 - DEFINTIONS – Section 07 00 00

SCHEDULE 3 - PROPOSAL BOND FORMS

Respondent is to inset an original proposal bond or a copy of cashier's check provided for proposal bond Purposes.
Original check is to be submitted along with proposal.

PART 3 - PRODUCT – Not Used
PART 4 -
PART 5 - EXECUTION
PART 6 -
STANDARIZED FORMS FOLLOW

END OF SECTION

PROPOSAL BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned *(Contractor)* _____ as Principal, and *(Surety)* _____ as Surety, are hereby held and firmly bound unto the CITY OF PHARR as OWNER in the penal sum of *(5% of proposal amount)* _____ for the payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this *(Date)* _____ day of *(Month)* _____, 2019.

The Condition of the above obligation is such that whereas the Principal has submitted to **CITY OF PHARR** a certain PROPOSAL, attached hereto and hereby made a part hereof to enter into a contract in writing for the construction ***CITY OF PHARR/PSJA AQUATIC FACILITY*** **Project No. 1819-35-510-C011-051**

NOW, THEREFORE, If said PROPOSAL shall be rejected, or in the alternate

If said PROPOSAL shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said PROPOSAL) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith and shall in all other respects perform the agreement created by the acceptance of said PROPOSAL then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such PROPOSAL; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____	_____
Principal	Witness
_____	
Title	
_____	_____
Surety	Witness
_____	
By: Attorney-in-Fact	

IMPORTANT - Surety companies executing BONDS must be authorized to transact business in the State where the project is located.

DOCUMENT 00 51 00
NOTICE OF AWARD

1.1 BID INFORMATION

A. Contractor(s) Legal Name (as registered with the Texas Secretary of State):

B. Bidder's Address:

C. Prime Contract: City of Pharr.

D. Project Name: City of Pharr/PSJA Aquatic Facility

E. Project Location: 3001 N Cage Blvd., Pharr, Texas 78577.

F. Owner: City of Pharr

G. Owner Project Number: 1819-35-510-C011-051.

H. Architect: The Warren Group Architects, Inc.

I. Architect Project Number: 971805

1.2 NOTICE OF INTENT TO AWARD CONTRACT

Notice: The above Bidder is hereby notified that their bid, dated XXXX, XX 2019, for the above Contract has been considered and the Bidder is hereby awarded a contract for City of Pharr/PSJA Aquatic Facility to consist of approximately 72,796 square feet of new Aquatic Facility with an alternate second level build-out of 1,212 s.f.

A. Alternates Accepted: The following alternates have been accepted by Owner and have been incorporated in the Contract Sum:

Alternate No. 1: To be determined.

Alternate No. 2: To be determined.

B. Contract Sum: The Contract Sum is XXXXXXXXX Dollars ($X.00).

1.3 EXECUTION OF CONTRACT

A. Contract Documents: Copies of the Contract Documents will be made available to the Bidder immediately. The Bidder must comply with the following conditions precedent within [10] Ten days of the above date of issuance of the Notice:

1. Deliver to Owner four [4] sets of fully executed copies of the Contract Documents.

2. Deliver with the executed Contract Documents Payment & Performance Bonds for 100% of the Contract Sum, bonds should reflect contractor's legal name in accordance with the Contract Document requirements.
3. Deliver with the executed Contract Documents "Approval of Sub-Contractors" Form.
4. Deliver with the executed Contract Documents Certificate(s) of Insurance required by the Contract Documents.
5. Form 1295 Disclosure.

B. Compliance: Failure to comply with conditions of this Notice within the time specified will entitle Owner to consider the Bidder in default, annul this Notice, and declare the Bidder's Bid security forfeited.

1. After the Bidder complies with the conditions of this Notice, Owner will return to the Bidder one fully executed copy of the Contract Documents during the Pre-construction Conference.

1.4 NOTIFICATION

A. This Notice is issued by:

Owner: **City of Pharr**

Title: CPM, Purchasing

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

APPROVAL OF SUB-CONTRACTORS

Project No. 1819-35-510-C011-051
CITY OF PHARR/PSJA
AQUATIC FACILITY

Prime contractors will not permit any Sub-contractor to start work on the project until the Sub-contractor has been approved by the project owner.

NAME AND ADDRESS OF PRIME CONTRACTOR:

_____ _____

_____ _____

SUB-CONTRACT DATA

NUMBER	TYPE OF WORK	SUB-CONTRACTORS NAME & ADDRESS	CONTRACT AMOUNT	ANTICIPATED START DATE	ANTICIPATED END DATE

CERTIFICATION BY PRIME CONTRACTOR

Each Sub-contractor listed above has established his/her ability and responsibility to perform the work to which the sub-contract relates. The applicable provisions of the contract, including labor and equal opportunity provisions, shall govern the work to which the subcontract relates, and each subcontractor has been advised as to the necessary contract provisions and the requirement to incorporate them in each subcontract.

_____ _____

CONTRACTOR DATE

APPROVED:	CONCUR:

THIS PAGE LEFT INTENTIONALLY BLANK

END OF SECTION

SECTION 00 60 00
FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A101, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."

a. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction."

2. The General Conditions are included in the Project Manual.

3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual.

4. Owner's document(s) bound following this Document.

1.2 ADMINISTRATIVE FORMS

B. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

C. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

D. Preconstruction Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."

2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."

E. Information and Modification Forms:

1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."

2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."

3. Change Order Form: AIA Document G701, "Change Order."

4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."

5. Form of Change Directive: AIA Document G714, "Construction Change Directive."

F. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."

2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."

3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."

5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION

SECTION 00 62 00
PERFORMANCE AND PAYMENT BONDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

This section describes the standardized forms for bond certifications.

1.2 REFERENCES – Not Used

1.3 DEFINTIONS - Section 0700

1.4 PERFORMANCE AND PAYMENT BOND (OR BONDS)

A. Following the current Section, Contractor shall insert the approved form of the statutory surety bond or bonds to ensure the performance of the Contract and payment of labor and materials. In addition to the corporation signatures of the surety company (ies) on the bond(s), each bond should be countersigned by the surety company's attorney-in-fact, authorize to act within the State in which the Project is situated.

B. The following form is provided for sample purposes only. Contracts and agreements have important legal consequences. It is imperative that you consult with your attorney concerning the proper drafting, completion, or modification of such documents.

1.5 PERFORMANCE AND PAYMENT BONDING REQUIREMENTS

A. Pursuant to the Texas Uniform Grant and Contract Management Act of 1981, the following minimum requirements apply to all contracts exceeding $25,000 in total value:

1. Performance bond on the part of the contractor for (100) percent (%) of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under the contract. Only if specifically noted in the Instructions to Respondents (Section 00210), for contracts under $50,000, Owner may exercise an option of withholding payment to construction contractors until completion of construction and acceptance of work by the Owner in lieu of such performance bonds.

2. A payment bond on the part of the contractor for (100) percent (%) of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

PRODUCT – Not Used

PART 2 - EXECUTION (FORMS ON FOLLOWING PAGES)

STANDARIZED FORMS FOLLOW

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That

_____
(Name of Contractor or Company)

_____
(Address)

a _____ hereinafter called Principal, and
(Corporation/Partnership)

_____
(Name of Surety Company)

_____
(Address)

hereinafter called Surety, are held and firmly bound unto

_____
(Name of Recipient)

_____
(Recipient's Address)

hereinafter called OWNER, in the penal sum of **_____(_____),** dollars in lawful money of the United States, for the payment of which sum we bind ourselves, our successors, and assigns, jointly and severally, by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER dated the _____ day of_____, 201___, a copy of which is hereto attached and made part thereof for the construction of:

CITY OF PHARR/PSJA
AQUATIC FACILITY
PROJECT NO. 1819-35-510-C011-051

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties in all the undertakings, covenants, terms, conditions, and agreement of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if it shall satisfy all claim and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right

of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each (Number) one of which shall be deemed an original, this the _____ day of _____, 201__.

	Principal
ATTEST:	
(Principal) Secretary (SEAL)	Signature
Witness as to Principal	(Print/Type Name)
(Address)	(Address)
ATTEST:	Surety
(Surety) Secretary	Attorney-in-Fact (Signature)
(SEAL)	
Witness as to Surety	(Print/Type Name)
(Address)	(Address)

NOTE: Date of BOND must not be prior to date of Contract (1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

PAYMENT BOND

_____
(Name of Contractor or Company)

_____
(Address)

a _____ hereinafter called Principal, and
(Corporation/Partnership)

_____
(Name of Surety Company)

_____
(Address)

hereinafter called Surety, are held and firmly bound unto

_____
(Name of Recipient)

_____
(Recipient's Address)

Hereinafter called OWNER, in the penal sum of **(_____) (_____),** dollars in lawful money of the United States, for the payment of which sum we bind ourselves, our successors, and assigns, jointly and severally, by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER dated the _____ day of _____, 201___, a copy of which is hereto attached and made part thereof for the construction of:

NOW THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUB-CONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUB-CONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each of which shall be
(Number)
deemed an original, this the _____day of _____, 201__.

Principal

ATTEST:

(Principal) Secretary
(SEAL)

Signature

Witness as to Principal

(Print/Type Name)

(Address)

(Address)

ATTEST:

Surety

(Surety) Secretary

Attorney-in-Fact (Signature)

(SEAL)

Witness as to Surety

(Print/Type Name)

(Address)

(Address)

NOTE: Date of BOND must not be prior to date of Contract (1) Correct name of Contractor; (2) A Corporation, a Partnership or an Individual, as case may be; (3) Correct name of Surety; (4) Correct name of Owner; (5) County or Parish and State; (6) Owner; (7) If Contractor is Partnership, all partners should execute bond.

SECTION 00 72 00
GENERAL CONDITIONS NOTICE

1.01 FORM OF GENERAL CONDITIONS

A. The “General Conditions of the Contract for Construction”, American Institute of Architects’ A.I.A. Document A201, Latest Edition “Sample Form” and “Supplementary Conditions” on file in the offices of the Architect and the Owner’s Supervising Engineer, are hereby a part of these Specifications, and shall apply and be binding to all Contractors as though written in full herein.

B. General Contractor shall be responsible to provide and fill out own A.I.A. Contract Documents.

C. The Contractors shall be held to have examined and become familiar with all provisions of the above referenced documents.

D. Certain provisions of these standard “General Conditions of the Contract for Construction” have been revised or modified by portions of this “NOTICE” and the “SUPPLEMENTARY CONDITIONS”. In all such cases, the provisions of the “NOTICE” and the “SUPPLEMENTARY CONDITIONS” shall take precedence, to the extent of any conflict or inconsistency, over these standard “General Conditions of the Contract for Construction”.

E. Wherever the word “Owner” appears in such “General Conditions”, and elsewhere in these documents, it shall be interpreted as “City of Pharr, TX”, so that the word “City of Pharr, TX” is hereby substituted for the word “Owner” throughout these documents.

F. Wherever the word “Contractor” or “Subcontractor” appears in these documents, it shall be interpreted to mean the Contractor who’s Proposal has been accepted for that respective Section of the Work.

1.02 SUPPLEMENTARY CONDITIONS

A. Refer to Section 00 73 00 for amendments to these General Conditions.

END OF SECTION

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

City of Pharr/PSJA Aquatic Facility
3001 N Cage Blvd., Pharr, Texas 78577

THE OWNER:
(Name, legal status and address)

City of Pharr
118 S. Cage Blvd.
Pharr, Texas 78577

THE ARCHITECT:
(Name, legal status and address)

The Warren Group Architects, Inc.
1801 S. 2nd Street Suite 330
McAllen, Texas 78503

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

Init.
/

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to Competitive Sealed Proposals, Instructions to Respondents, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely

upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during

that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

Additions and Deletions Report for
AIA® Document A201™ – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 19:45:33 ET on 06/09/2019.

PAGE 1

City of Pharr/PSJA Aquatic Facility
3001 N Cage Blvd., Pharr, Texas 78577

...

City of Pharr
118 S. Cage Blvd.
Pharr, Texas 78577

...

The Warren Group Architects, Inc.
1801 S. 2nd Street Suite 330
McAllen, Texas 78503

PAGE 10

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to ~~bid,~~ Competitive Sealed Proposals, Instructions to ~~Bidders,~~ Respondents, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 19:45:33 ET on 06/09/2019 under Order No. 0472903255 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction , as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 7400
SPECIAL PROJECT CONDITIONS FOR CIVIL - SITE WORK

In all cases where these Special Project Conditions conflict with the Technical Specifications Sections, Plans, General Conditions of the Agreement, Special Conditions of the Agreements, Contract Conditions, or any other document contained or attached or made a part herein, these Special Project Conditions shall govern. The work associated with these Civil-Site Plans and Specifications are part of the complete set of Construction Documents for this Project as prepared by the Architect. The Contractor shall refer to the Construction Plans and Specifications for Architectural, Electrical, Lighting, Mechanical, Plumbing, and Landscaping for clarification and to aid in coordination of all components of the Project.

ALL EXCAVATION IS UNCLASSIFIED. The Contractor shall refer to the Structural Engineer's Plans contained in the Complete Construction Document Set for specific specifications regarding the building pad subgrade preparation requirements.

1.1 **COMPLIANCE WITH PLANS AND SPECIFICATIONS:** It is the intention that all Civil Engineering Site related work is done in strict accordance with the plans and specifications, complete in place. Any deviations from these plans due to any reason shall be submitted in writing to the Owner's representative Project Administrator and such deviations must be approved in writing by the Architect/Engineer before such modification.

1.2 **EXCAVATION, SUBGRADE PREPARATION, EMBANKMENT:** The Contractor shall do all necessary excavation, filling, fine grading, trenching, demolition, grading, backfilling, dewatering, tree removal, etc., to complete the project. Such costs shall be subsidiary to the various items of the proposal and shall not be paid directly. All material removed and not deemed salvageable, shall become the property of the contractor and he shall be responsible for removing it from the site at no extra expense to the owner. It will be necessary to grade as shown within the "project limits" on the plans. Any material used for fill must be free of trash, large boulders, organic or other material or debris, and in accordance with specifications. All fill material shall be placed, spread shaped and compacted to 98% standard proctor density and shall have a maximum P.I. (Plasticity Index) of 12. Any material unsuitable for fill shall be rejected and shall become the property of the Contractor and disposed of at the expense of the Contractor.

1.3 **PROTECTION OF THE SITE:** All Trees, Plants, Grass and Shrubs, outside limits of construction, shall always be protected . The areas in and adjacent to the construction site shall be restored to their original conditions after necessary fine grading is completed. The Contractor shall provide new grass of the same type removed to restore damaged areas. Only quality sandy loam topsoil shall be used for filling the top four inches of those areas damaged or filled. The cost for doing such work shall not be paid for directly but shall be subsidiary to the various items of the proposal.

1.4 **CONSTRUCTION STAGING AREA:** The City of Pharr will designate a construction staging area for the project within the Project Site. The area shall include security fence with a service entrance in accordance with the SWPPP typical details and shall always be kept clean . All stored materials shall remain secure.

1.5 **QUALITY CONTROL AND MATERIALS TESTING:** Quality Control testing shall be done by the Owner on random testing selected by the owner's representative project administrator to determine if the specifications are being adhered to. Retesting of failed samples shall be charged to the Contractor and deducted from his final payment, and no additional compensation will be made or allowed for reworking the necessary defective work not meeting the specified work of the plans and specifications.

A. Testing for the Contractor's benefit and construction quality control shall be paid directly by the Contractor.

B. It will be the Contractor's responsibility to submit to the OWNER'S REPRESENTATIVE PROJECT ADMINISTRATOR, test results for materials used for the project, such as base material, subgrade, concrete and asphalt.

C. The CONTRACTOR will at all times furnish the necessary materials, equipment and assistance to secure the necessary samples to be tested by others.

D. The strength, thickness, density and other requirements have been indicated on the plans and/or Specifications.

E. Re-Tests due to failures shall be paid for by the Contractor and deducted from his final payment.

1.6 **CONTACT INFORMATION:** The Contractor shall furnish the Owner's Representative Project Administrator and Engineer the names, address and telephone numbers of all personnel responsible for the work in case of emergencies.

1.7 **REPAIRING OF DAMAGES:** Damages done to all existing utilities, power poles, fences, signs, driveways, culverts, pavement, curbs, drainage systems, sprinkler systems, hose bibs, irrigation lines, etc., shall be repaired by the contractor at no cost to the Owner, and such costs shall be subsidiary to the various unit items in the proposal.

1.8 **EXISTING WATER LINES AND FIRE HYDRANTS:** The Project Site has existing water lines and fire hydrants. The Contractor shall verify the location and depth of these lines. The Plans call for some of the existing fire hydrants to be relocated. The Contractor shall take great care in the removal and replacement of the fire hydrants and valves as required. The relocated fire hydrants shall be installed with all the necessary 6" PVC C-900 DR 18 water line and gate valves in accordance with the City of Pharr Standard product list and specifications. The relocated fire hydrants shall be prepared for priming and painting in accordance with the City Standard paint and colors. Any material, fire hydrants, valves, etc., deemed operational and useful shall be salvaged and hauled off to the City of Pharr Utility Department warehouse.

1.9 **UTILITY UNDERGROUND CONDUITS:** Electrical conduits, plumbing and irrigation conduits are not shown in the Civil Plans. The Contractor shall refer to electrical, lighting, plumbing and landscaping plans for locations, size and inverts of such conduits.

1.10 **IRRIGATION STANDPIPE REMOVAL:** The existing 24" diameter irrigation standpipe located on the north side of Sioux Road shall be removed and disposed. The Contractor shall remove the standpipe below ground level to the existing top of the existing irrigation main line. The excavation shall be backfilled with selected material and compacted to 95% SPD. The cost for demolition backfilling and disposal shall be subsidiary to the project cost.

1.11 **POWER POLE/PEDESTRIAN SIGNAL REMOVAL AND RELOCATION:** The Contractor shall be responsible for the removal and relocation of the power poles located along the U.S. 281 Expressway southbound frontage road which interfere with the construction of the main entrance driveways into the Aquatic Center. In addition, the pedestrian crosswalk signal will have to be relocated to accommodate the new intersection crosswalk. The Contractor is directed to contact the proper utility company (AEP) or the Texas Department of Transportation for further directives. The cost associated with such relocations shall be paid for by the Contractor and subsidiary to the project cost.

1.12 **PROJECT LIMITS:** The Contractor shall be limited only to existing project limits. Any damages done to property outside these designated work areas will be corrected to its original or better conditions by the contractor at no extra cost to the Owner. It is important that the Contractor be aware of the work limits so that no damage can result to those areas outside these limits.

1.13 **SITE CONTRACTOR COORDINATION WITH OTHERS:** Construction work performed by others within the areas of the project-designated areas will not relieve the Contractor from insuring his work and work performance. The Contractor shall be responsible to coordinate all work in order to avoid any conflicts.

1.14 **SETTING BUILDING CORNERS AND CONSTRUCTION LAYOUT:** The Contractor shall be responsible for establishing the proposed building corners based on the Structural Foundation Plans and dimension control offset information furnished in the Plans. Construction layout and staking for all infrastructure shall be done by a Licensed Professional Land Surveyor in the State of Texas for the entire project. Such costs shall be the responsibility of the Contractor and subsidiary to the project cost. Horizontal and Vertical control will be provided by the Owner before construction. The Contractor is responsible for protecting survey control and benchmark provided by the Owner. Any additional survey control required from the Owner will be paid for by the Contractor.

1.15 **EXISTING UTILITIES:** The plans attempt to show locations of utility lines taken from existing records and visible from field surveys. The Plans however do not show all the horizontal and vertical locations (depths) of all the existing utilities, including water, sanitary sewer, storm sewer telephone, fiber optic cable and gas lines. The Contractor is responsible to call the appropriate public or private utility company to locate all these lines before construction operations begin and verify the location and depths of these lines, especially as anticipated conflicts with proposed construction of water and sanitary sewer lines. The Contractor shall exercise extreme care in working in the vicinity of these lines.

1.16 **SOIL EROSION AND STORM WATER POLLUTION PREVENTION PLAN:** The Contractor is expected to conduct his work in such a manner as to minimize any soil erosion or sediment runoff from the construction site. Earth cuts and fills shall have smooth, flat side slopes, as generally indicated on the plans to preclude erosion of the soil. Such operations should be timed consistent with the actual need for doing the work and only leave the raw, unprotected and stabilized surfaces for a minimum of time.

A. The Contractor shall be responsible for correcting any erosion that occurs at his cost without claim for extra compensation.

B. The Contractor shall prepare, administer and implement a storm water pollution prevention plan (SWP3) as per Texas Commission on Environmental Quality (TCEQ) rules and regulations for areas that disturb more than 1 acre. All Application fees for the SWP3 shall be paid for by the contractor. A copy of the TPDES General permit TXR15000 is included with the Civil Specifications as well as erosion control devices shown in the plans as a guideline. Contractor shall refer to and comply with all other applicable discharge permits as per TCEQ rules and regulations.

1.17 **TRAFFIC CONTROL:** The Contractor shall coordinate his work with the City of Pharr and or the Texas Department of Transportation in order to minimize inconvenience to traffic along the southbound frontage road of U.S. 281 Expressway, Sioux Road and Canna Street especially during peak hours. The Contractor shall contact the City of Pharr Traffic Department when making utility connections, parking lot entrance tie-ins into the existing frontage streets where applicable, and any other work that will entail traffic disruptions. Driveway entrance permits approval will be required prior to initiating construction along U.S. Expressway 281. The Contractor shall abide by all the conditions required by such Permit. The Contractor is responsible for preparing and implementing a traffic control plan approved by the City of Pharr and in accordance to City standards for construction along adjoining streets ant his own cost. The Traffic Control Plan shall be prepared by a Registered Professional Engineer licensed in the State of Texas. All barricades, signs, flagmen,

temporary markings, regular inspection and maintenance shall be included as part of this work and shall be paid by the contractor.

1.18 **AVOIDING CONFLICTS:** The Contractor shall coordinate all Civil Work with the other elements of the project in order to avoid location and grade conflicts. It is important that deep gravity utility lines such as sanitary sewer, storm sewers be installed first. The Contractor will note that the minimum utility line cover to water lines shown in the Typical Details is measured from the top of the pipe to the SUBGRADE ELEVATIONS and not to finish grade. If conflicts do occur, the Contractor shall advise the Engineer of these conflicts before adjustments are made.

1.19 **AMERICAN DISABILITIES ACT (ADA):** All flatwork shown in the Civil Plans or otherwise shall meet ADA standards. It is the intent of this project to comply with the latest TAS Texas Accessibility Standards. The Contractor is responsible to set all the site work, such as sidewalks, ramps and handicap parking areas according to the latest TAS standards. The Contractor shall notify the Owner's Representative project administrator when forms for all flat work are set in order to determine if TAS standards have been complied with prior to pouring the walks or other TAS sensitive areas. Failure to do so shall be reason to reject the work and any reconstruction of affected areas shall be paid for by the Contractor.

1.20 **STORM SEWER PIPE MATERIALS:** When specified, high performance Polypropylene Storm Sewer Pipe (PP) shall meet or exceed ASTM 2736l ASTM F2881 AND AASTHO M330 for 12 inches to 60-inch diameter pipes and shall comply with manufacturer's recommended installation procedures and ASTM D2321. When specified, all Reinforced Concrete Pipe (RCP) shall be C-76 of the class specified in the plans with rubber gasket joints. Installation of RCP shall be in accordance with the Typical Trench Details and the Specifications.

1.21 **PRECAST STORM SEWER APPURTANANCES:** All precast Storm Sewer Inlets shall be furnished with pre-manufactured monolithic inlet bottoms.

1.22 **ASPHALT PAVING:** The Contractor shall refer to the Typical Detail Section of the Plans as well as the Specifications contained in the Contract Documents for the proposed asphalt paving design requirements. Please note that site paving will require both Light and Heavy-Duty pavement sections as indicated in the Plans and specified in the Typical Sections of the Civil Plans.

1.23 **PAVEMENT STRIPING AND MARKINGS:** The proposed permanent pavement markings shall be applied in all areas designated on the plans. Prior to placing pavement markings, prepare pavement surface of sufficient area for the pavement markings, shown on the plans. Remove all contamination and loose material. Avoid damaging the pavement surface. Approved pavement surface preparation methods are sweeping, air blasting, flair milling, and blast cleaning unless otherwise specified on the plans. Reflectorized pavement markings shall be installed in accordance to the 2004 Texas Department of Transportation (TxDOT) standard specifications item 666, Type I.

A. Permanent pavement markings shall be placed no later than two weeks after final surfacing.

1.24 **FLEXIBLE BASE MATERIAL:** Caliche (Argillaceous Limestone, Calcareous or Calcareous Clay Particles) will be allowed as flexible base, if the material requires the addition of lime or cement to meet strength requirements for Grade 1 or Item 247 of TX Dot's Standard Specifications. The cost for percent lime or cement to be added shall be subsidiary to the flexible base unit price and included with the final cost for placement of the flexible base. The Contractor shall submit a Geotechnical Report or Certificate showing the Compliance to this Specification.

Master Flexible Base Aggregate Grading Requirements:

Aggregate Size	Percent Retained
2"	0
½"	20-60
No. 4	40-75
No. 40	75-85
Max. P.I.	12
Max Wet Ball P.I.	15
Wet Ball Mill Max Amount	50
Min. Comp. Strength (psi)	180 at 15 psi Lateral Pressure

1.25 **PIPE CONNECTIONS TO STORM SEWER STRUCTURES:** Reinforced Concrete Pipe (RCP) Connections into inlet structures shall be watertight; openings in storm sewer structures shall be pre-manufactured or neatly saw cut to a diameter that is a ¼ - ½ inch larger than the outer diameter of the RCP. Secured with a concrete collar and sealed with high strength mortar. Hammering or breaking of the structure will not be allowed. Structures that are hammered and that expose structural cracks will be replaced by the Contractor at no additional cost to the Owner.

1.26 **PAVEMENT QUALITY:** The Contractor shall be aware that the Owner expects the new pavement surfaces whether Asphalt or Concrete to be of the best quality and rideability. Concrete Pavement reconstruction along Sioux Road shall match existing thickness, reinforcement and finish. Rideability tests shall be conducted at the discretion of the Owner and the Engineer. Standard methods of testing will be implemented as required. The Contractor shall repair any such portion or portions of the project not meeting acceptance.

END OF SECTION

SECTION 00 81 00
SUPPLEMENTARY CONDITIONS

PART 2 - GENERAL

2.1 SECTION INCLUDES

This section describes the supplementary conditions of the project and contract agreement. The conditions contained in this Section are specific administrative and policy requirements in addition to the general conditions and other requirements listed in the contract documents.

2.2 REFERENCES – Not Used

2.3 DEFINITIONS - Section 0700

2.4 INDEMNIFICATION

A. The Contractor agrees to indemnify and to hold the Owner and the *(Architect or Engineer)* harmless from and against any and all damages, claims, demands, suits, judgments and costs including attorney's fees and expenses for or on account of damage to property of any person, firm corporation, or Government agency, or death of or injury to any person or persons (including property and employees of the Owner, the Contractor, and employees of the Contractor) directly or indirectly arising out of, or caused by or in connection with the performance of or failure to perform any work provided for hereunder by the Contractor, his subcontractors, or their or the Contractor's agents, servants, or employees.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, Engineer, Engineer's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Section shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, *(Architect or Engineer)*, *(Architect's or Engineer's)* Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this paragraph shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

D. In case the Contractor finds any discrepancy between the conditions at the site and the requirements of these plans and specifications, he shall notify the Owner in writing before the opening of proposals and the Owner will issue the necessary instructions to all respondents.

E. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work or (2) comply with the more stringent requirement; either or both in accordance with the Architect's reasonable interpretation. The

terms and conditions of this paragraph 1.2.3, however, shall not relieve the Contractor of any obligations set forth in Paragraphs 3.2 and 3.7. Before ordering materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. Any difference, which may be found, shall be submitted to the Architect for resolution before proceeding with the Work. Such separations shall not operate to make the Architect an arbiter to establish subcontract limits.

F. Titles of Sections and Articles in these Specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work. The Contractor shall be solely responsible for omissions or duplications by the Contractor or any Subcontractors due to real or alleged error, either direct or implied, in arrangement of matter in the Contract Documents.

G. Contractor shall check Drawings and Specifications immediately upon their receipt and shall notify Architect in writing not later than ten (10) days after receipt of them, of errors, discrepancies, or omissions. Contractor shall verify dimensions and details before ordering materials for laying out work and shall be responsible for errors that might have been avoided by such check. Deviations from Drawings and dimensions shall be made only with the Architect's permission. No exchange or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the Drawings. Any difference, which may be found, shall be submitted to the Architect for review and instruction before proceeding with the work.

H. Specifications and Drawings are intended to be complementary and in agreement each with the other. All work or materials called for by either shall be Performed and/or furnished as if called for by both. In cases of discrepancy concerning dimensions, quantities, and location, the contractor shall, in writing, call to the attention of the Architect any discrepancies between Specifications, Plans, Details or Schedules. The Architect will then inform the Contractor, in writing, which document takes precedence. Should the Contractor not notify the Architect as per the prior instructions, the greater amount of work, cost and/or materials shall be included in the base proposal or alternate proposal amount as part of this agreement.

I. These Specifications are intended to supplement the Drawings, the two being considered cooperative and, therefore, it will not be the province of these Specifications to mention any portion of the construction which the Drawings are competent to explain. Such omissions will not relieve the Contractor from carrying out such portions as are only indicated from the Drawings, and should items be required by these Specifications which are not indicated on the Drawings, they are to be supplied.

J. The Contractor shall supply all labor, materials, transportation, apparatus, light, energy, scaffolding and tools necessary for the entire proper completion of the Work.

K. Unless specified otherwise, all of the materials incorporated in the work shall be new and of the best of the kind of grades specified and all workmanship be up to the best recognized standard known to the various trades.

The Drawings, Specifications, and other similar or related documents and copies thereof are furnished to the Contractor for the purpose of performing the Work and are, and shall remain, the property of the Architect.

1.5 INSURANCE

A. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance this Section and the Contract Documents, shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner, Construction

Manager and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with this Section and the Contract Documents.

B. The Contractor will be held accountable for all insurance coverage including those of subcontractors and provide that all the above-mentioned policies will be with insurance carriers.

C. The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner.

1. Worker's Compensation Insurance: The Contractor shall procure and shall maintain during the life of this Contract, Worker's Compensation Insurance as required by the State of Texas for all of employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Worker's Compensation Insurance.

2. Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The Contractor shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the following amounts shown in Insurance Limits in Paragraph 1.6 below.

3. All Builder's Risk Insurance (Fire and Extended Coverage): The Contractor shall procure and shall maintain during the life of this Contract, All Builder's Risk Insurance during the duration of the project.

4. All Builder's Risk Insurance (Fire and Extended Coverage): The Sub-Contractors shall procure and shall maintain during the life of this Contract, All Builder's Risk Insurance during the duration of the project.

5. The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance reasonably required by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until the insurance required of the subcontractor has been so obtained and approved.

A. Scope of Insurance and Special Hazards: The insurance obtained, which is described above, shall provide adequate protection for the Contractor and his/her subcontractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any of the special hazards that may be encountered in the performance of this Contract.

B. Proof of Insurance: The Contractor and Subcontractors shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered, except after ten (10) days written notice has been received by the Owner."

1.2 INSURANCE LIMITS

The Contractor and Subcontractors, at his expense, shall take out and keep in force throughout the term of this Contract, the following All Risks' Insurance coverage in the amounts specified below to cover all of his operations in connection with the work to be performed under the Technical Specifications. The insurance certificates shall be submitted to the Owner for acceptance prior to move in and beginning work.

MINIMUM INSURANCE REQUIREMENTS

INSURANCE TYPE	LIMITS OF LIABILITY
A. Workman's Compensation	$1,000,000 per occurrence
B. General Liability Comprehensive Form Premises - Operations Products/Completed Operations Hazard Contractual Insurance Independent Contractors Personal Injury	$1,000,000
C. Automobile Liability Comprehensive Owned Hired Non-owned	$1,000,000
D. Excess Liability Umbrella Form	$1,000,000
E. Property Damage	$1,000,000

The remaining term of all policies shall extend at least to the completion date of this Contract; if the expiration date shall occur prior to final completion of all operations hereunder, Contractor shall, not less than fifteen (15) days prior to expiration date, furnish evidence of renewal of or extension of such insurance. All such evidence of insurance shall provide for ten (10) days prior notice to be given to Owner in the event of cancellation.

1.3 EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION PROGRAM

A. Equal Employment Opportunity

1. The Contractor will not discriminate against any employee or the applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, promotion, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the owner.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3. The Contractor will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this contract so that such provisions will be binding upon each subcontractor, provided that the foregoing provisions shall not apply to contracts or subcontracts for standard commercial supplies or raw materials.

4. The Contractor shall take affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions.

5. Contractors are encouraged to participate in voluntary associations which assist in fulfilling their affirmative action obligations.

6. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority.

7. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

8. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts.

9. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents.

B. Affirmative Action for Handicapped Workers

1. The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, promotion, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

C. Non-Segregated Facilities

1. The Contractor certifies that he does not and will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not and will not permit his employees any segregated facilities at any of his establishments or permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. As used in this paragraph the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are

in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

PART 2 - OWNER

2.1 INFORMATION AND SERVICE REQUIRED OF THE OWNER

A. 2.1.1. Architect will furnish Contractor Online Procurement and Contracting Documents as per notice. Any other questions to be in written/e-mailed format to the attention of Laura Nassri Warren at lwarren@twgarch.com, Andrina De Anda andrina@twgarch.com and Maritza Cardenas mcardenas@twgarch.com. Online access will be provided to the prime contractor only.

2.2 OWNER'S RIGHT TO SEPARATE CONTRACT

2.2.1 Although it is contemplated that this Contract shall include all of the work intended to be done at this time, it is possible that the Owner may let other Contract in connection with the work herein specified. In any event, the Owner reserves the right to do so, in which case the Contractor shall afford reasonable opportunity for the storage of materials and the execution of work by others.

PART 3 CONTRACTOR

3.1 REVIEW OF CONTRACT DOCUMENTS

3.1.1 Contractor shall carefully study and compare the Agreement, Conditions of the Contract, Drawings, Specifications, Addenda and Modifications and shall at once report, in writing, to the Architect any error, inconsistency or omission he may discover. Contractor shall be liable for any damage to Owner for failure to so report any error, inconsistency or omission he may discover or should have discovered, but he shall not be liable to Owner or Architect for any damage resulting from any such error, inconsistency or omission he should not have discovered or which he did discover and at once so reported. Contractor shall do no work without approved Drawings and Specifications.

3.1.2 Should the Specifications and Drawings fail to particularly describe the material or kind of goods to be used in any place, then it shall be the duty of the Contractor to make inquiry of the Architect as to what is best-suited. The material that would normally be used in this place to produce first quality finished Work shall be considered a part of the Contract.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 In laying out the work, the Contractor shall verify all measurements and dimensions and shall immediately report any errors to the Architect. The Contractor shall employ an experienced and competent instrument person to lay out the structure and establish a permanent and accessible bench mark from which the grades may be established and checked from time to time during the progress of the work. Contractors shall lay out building corners accurately and secure approval of the Architect before proceeding with excavation.

3.4 LABOR AND MATERIALS

3.4.1 Not later than thirty (30) days from the Contract Date, the Contractor shall provide a list of the names of the manufacturers proposed to be used for each of the following products listed in the Instruction to Respondents and, where applicable, the name of the installing subcontractor. The Architect will promptly reply in writing to the Contractor stating whether the Owner or the Architect have any reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure of the Owner or the Architect to reply promptly shall not constitute a waiver of any of the requirements of the Contract Documents and all products furnished by the listed manufacturer must conform thereto.

3.4.2 Products are generally specified by ASTM and other reference standard, and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed but may not substitute others except as provided in Paragraph 3.4.3 below. When only one product and manufacturer is Specified, this is the basis of the Contract, without substitution or exception.

3.4.3 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:
The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to any separate contracts."
The request is accompanied by accurate cost data on the proposed substitution with the product specified, whether or not modification of the Contract sum is to be a consideration.

3.4.4 By making requests for substitutions based on Paragraph 3.4.3 above, when forwarded by the Contractor to the Architect, the Contractor:
Represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
Will provide the same guarantee for the substitution that he would for that specified.
Certifies that the cost data presented is complete and includes all related costs under this Contract but excludes costs under any separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent.
Will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

States that the proposed substitution is in full compliance with the Contract Documents and applicable codes.
Will provide a list of other trades, (if any), which may be affected by the substitution.
Shall be responsible for any effect upon related work in the Project of any substitution and shall pay any additional costs generated by any substitutions.

3.4.5 Substitutions will not be considered if:
They are indicated or implied on Shop Drawings, Product Data or Sample submissions without the formal request required in paragraph 3.4.3 above.
For their implementation, they require a substantial revision of the Contract Documents or work of the owner or separate Contractors in order to accommodate their use.

3.4.6 After the Contract has been executed, the owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth herein and in the Contract Documents. By making request for substitution, the Contractor (a) represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified; (b) represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified; (c) certifies that the cost data presented is complete and includes all related costs under this Contract but excludes cost under separate contracts and excludes the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and (d) will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.5 WARRANTY

3.5.1 Guarantees:
Contractor shall guarantee all work performed under this Contract as specified, delivering written guarantees to Owner, through Architect, upon completion in accordance with Section 01 70 00.
For the convenience of the General Contractor, the following is a summary including, but not limited to, releases, warranties, and the guarantees mentioned in the various Sections of these Specifications to be furnished to the Owner, through the Architect, upon completion of the Project. Where the requirements listed herein conflict with those in the various sections of these Specifications, the stricter requirements will take precedence.
General Contractor's notarized affidavit that all bills for labor and materials have been paid in full.
General Contractor's guarantee against defective materials and/or workmanship, for ONE YEAR FROM DATE OF FINAL ACCEPTANCE OF THE WORK.
Roofing subcontractor shall furnish a TEN (10) YEAR written certificate guaranteeing that all roofing materials are installed in accordance with Plans and specifications, that all roofing work is free from faulty materials and workmanship, that pitch will not leak or drip or stain any part of the building and providing for repair and replacement of any faulty materials and/or workmanship.
The Flashing subcontractor's guarantee for a period of FIVE (5) YEARS against defective materials and/or workmanship.

Caulking subcontractor's guarantee for a period of TWO (2) YEARS from the date of final acceptance of the work.

Electrical subcontractor's guarantee for a period of ONE (1) YEAR from time his work is accepted, against defective materials and/or workmanship.
All other guarantees not listed above but specified in the technical portion of the Specifications shall be furnished to the Owner upon completion of the Project.

3.5.2 Without limiting any other warranty, the Contractor shall warrant for a period of twelve (12) months that the buildings shall be watertight and leak proof at every point and in every area, except where leaks can be attributed to damage to the building by external forces beyond Contractor's control. The Contractor shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at his own expense, do any work necessary to make the building watertight. Contractor shall also, at his own expense, repair or replace any other damaged material, finish, and furnishing, damaged as a result of this water penetration and return the building to its original condition.

3.6 TAXES

3.6.1 Owner shall be exempt from sales taxes. Owner shall provide sales tax exemption certificate.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Upon completion of the work, Contractor shall deliver to the owner, through the Architect, all required Certificates of Inspection.

3.7.2 Any reference in the Specifications text to codes, standard specifications, or manufacturer's instructions shall mean the latest printed edition of each in effect at the contract date.

3.8 SUPERINTENDENT

3.8.1 Contractor and his prime subcontractors shall employ competent superintendents and necessary assistants who shall be in attendance at the Project site during the progress of the work. The superintendents shall be satisfactory to the Architect and shall not be changed except with the consent of the Architect, unless the superintendents leave the employ of the Contractor or the prime subcontractor.

3.8.2 At the beginning of Project, Contractor shall submit, in writing, to the Architect the name of his superintendent and the names of the superintendents of his prime subcontractors, this to include a list of past projects on which each superintendent has worked or been in charge of.

3.8.3 Superintendents shall not be removed from the Project by Contractor or his prime subcontractor without written requests and approval by the Architect.

3.8.4 Superintendent shall represent Contractor and all communications given by Superintendent shall be as binding as if given by Contractor. Important communications

will be confirmed in writing. Other communications will be so confirmed on written request in each case.

3.9 CONTRACTOR'S CONSTRUCTION SCHEDULE

3.9.1 The progress schedule shall be of a type similar to the CPM, PERT, DYliA-PERT schedules or their equivalent in the opinion of the Architect. The number of activities and structure of the progress schedule shall be adequate to explain the various stages of construction. Completed progress schedule shall be submitted to Architect no later than thirty (30) calendar days after date of Agreement and shall be updated during construction as required to keep it current. Nothing in this requirement shall be deemed to be usurpation of the Contractor's authority and responsibility to plan and schedule the work as he sees fit, subject to all other requirements of the Contract Documents.

3.10 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.10.1 Submission of Shop Drawings and Samples to Architect required for ONLY those times specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, Architect will not be obliged to review them. Contractor shall be responsible for procuring Shop Drawings for his own use as he may require for the progress of the work.

3.10.2 The term "shop drawing" as used herein also includes, but is not limited to, fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment or systems and the position thereof conforms to the Contract requirements. As used herein, the term "manufactured" applied to standard units usually mass produced; and "fabricate" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining work; amplify design details or mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.

3.10.3 Following Contractor's review and approval, he shall submit to the Architect shop drawings and samples in the quantities listed in Section 01 33 23. Architect, at Owner's expense, will make prints for himself, Owner and Project Representative
and then return the reproducible copy to Contractor in order that as many additional prints may be made, at Contractor's expense, as he may require for the remaining parties concerned.

3.10.4 Manufacturer's instructions: Where any item of work is required by specification to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, contractor shall procure and distribute the necessary copies of such instructions to all concerned parties.

3.10.5 Materials in the Specifications may be followed by the words "or as approved by the Architect". In these cases, wherever the name or brand of a manufacturer's article is specified, it is used as a measure of quality and utility for a standard. If Contractor desires to use any other brand or manufacturer of same quality, appearance and utility to that specified he shall request substitution as provided in paragraph 3.4.

3.11 USE OF THE SITE

3.11.1 The Contractor shall arrange and maintain material and equipment in orderly manner keeping walks, drives, roads and entrances unencumbered.

3.12 CLEANING UP

3.12.1 Besides the "broom cleaning", the following special cleaning is required just prior to acceptance:

Remove stains; wash and polish glass, inside and outside. This work shall be done by persons skilled and equipped for such work.

Remove foreign matter, marks, stains, foreign paint, fingerprints, soil and dirt from (and have in a polished condition where appropriate) the following:

Painted, decorated and stained work.

All hardware, fixtures and incorporated equipment.

All finished surface and metal surfaces, whether interior or exterior.

All doors and windows.

3.12.2 In addition to clean-up provisions of the Specifications, Contractor shall take appropriate steps to prevent air-borne dust due to work under this contract. Water shall be applied wherever practical to settle and hold dust to a minimum, particularly during the excavation and moving of materials.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT’S ADMINISTRATION OF THE CONTRACT

The term 'aesthetic effect' as used herein refers to color, texture, profile and juxtaposition of masses. The Architect shall be the sole interpreter of the design intent with respect to such matters, but the Architect's authority with respect thereto shall not contravene any other rights of either the Owner or the Contractor ascribed to them by other provisions of the Contract.

ARTICLE 5 - SUBCONTRACTORS

5.1 No subcontractor shall be let to the job site until the list of proposed subcontractors as submitted at the proposal opening is approved, in writing, by the Owner.

5.2 The General Contractor shall bind all Subcontractors, the Mechanical Contractor and the Electrical Contractor to the terms of the Contract Documents.

5.3 The General Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

5.4 Nothing contained in the Contract Documents shall create any contractual relations between any Subcontractor and the owner.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 MUTUAL RESPONSIBILITY

6.1.1 Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of the trades, other contractors, subcontractors, and material suppliers engaged upon or in connection with the work as well as those of his own employees, and he shall exercise every effort to assure a harmonious cooperative working relationship on the part of all concerned. He shall be prepared to guarantee to each of his subcontractors and foremen all of the dimensions which they may require for the fitting of their own to adjoining work and shall do or shall cause his agents to do, all fitting and adjusting necessary to make the several parts of the work come together properly and fit the work to receive or be received by, the work of other Contractors.

ARTICLE 7 - CHANGES IN THE WORK

7.1 CHANGE ORDERS

7.1.1 Any adjustment to contract sum shall be determined by methods described in 7.2.1, 7.2.2 and 7.2.3.

7.2 CONSTRUCTION CHANGE DIRECTIVES

7.2.1 The allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the schedule in the Proposal Form.

7.2.2 In allowance for overhead and profit, in accordance with the schedule, the Contractor is to provide – “In the Proposal Form.”

7.2.3 In order to facilitate checking of quotations for extras or credit, all proposals, except those so minor that their property can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and subcontractors. Labor and

materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over $100.00 be approved without such itemization. Every change itemization shall be submitted on a Change in work/Cost Analysis form.

ARTICLE 8 - TIME

8.1 DEFINITIONS

8.1.1 Contract Time commences at the time of Notice to Proceed.

8.2 DELAYS AND EXTENSIONS OF TIME

8.2.1 Contractor shall have all materials delivered at the site in such quantities as required for the uninterrupted progress of the work and the least obstruction of the premises and the adjoining property. No extension of time or extra cost will be allowed for failure by Contractor to order the material on time or in insufficient quantities.

8.3 WEATHER DELAY

8.3.1 For the purpose of calculating extensions of time due to inclement weather, the attached local climatological data will be used.

8.3.2 Unless the Owner considers that unusual circumstances warrant consideration, extensions of time because of inclement weather will be granted for any work only to the extent that the number of days of precipitation (.04" or more) and/or the number of days of freezing weather (32 degrees and below) exceeds the mean for that month; provided that no one day will be counted more than once; and provided further, that if a day lost because of weather falls immediately before a non working day or days, such as a holiday or weekend, such working days shall be considered as lost time. The mean number of days of Precipitation and freezing weather shall be established by the tabulation of normals, means and extremes published by National Oceanic and Atmospheric Administration in the most recent Local Climatological Data for the closest reporting station to the site of the work. No claim will be considered unless it is accompanied by the attached "Time Extension Request" form completed within two weeks of the time referenced inclement period.

8.4 LIQUIDATED DAMAGES

8.4.1 Respondent must agree also to pay as liquidate damages the sum of $1,000.00 (One Thousand Dollars) per day for each consecutive calendar day thereafter as provided in the general conditions.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 All costs of overtime work require by the nature of this work, except emergencies as covered in Article 10 shall be included in the Proposal Costs.

9.2 APPLICATIONS FOR PAYMENTS

9.2.1 In each Application for Payment, the Contractor shall certify that such Application for Payment represents a just estimate of costs reimbursable to the Contractor and also shall certify as follows:

(a) There are no known mechanic's or material men's liens outstanding at the date of this requisition, that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application, and that, except for such bills not paid but so included, there is no known basis for the filing of any mechanic's or material men's liens on the Work, and that waivers from all Subcontractors and material men's have been obtained in such form as to constitute an effective waiver of lien under the laws of the location of the Project.

(b) The Contractor shall within thirty (30) days of receipt of notice of the existence of any lien filed against the Project by any subcontractor, supplier of materials or any other person or entity claiming to be a creditor of the Contractor, cause the same to be removed as of record or provide a bond to indemnify or a cash deposit to the Title Company in an amount equal to the lien.

9.2.2 Along with the Progress Schedule, specified herein before, Contractor shall submit to Architect a schedule of the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the Progress Schedule. On or near the tenth of each month, the Owner agrees to pay to the Contractor an amount to be determined by taking ninety percent (95%) of the value of labor and materials incorporated in the work, plus material not incorporated in the work, but approved by the Architect under the provisions of the Contract Documents, up to the date of payment proposed to be made, less the aggregate of all previous payments and deductions provided for in the Contract Documents.

The retention shall be paid thirty-five (35) calendar days after the date of recording by the Owner of the Notice Completion of all the work to be done under this contract, providing there are no undercharged or unsecured liens, attachments or claims in connection with the work.

9.2.3 Payments made on account of materials not incorporated in the work shall only be made on material which has been worked to a special design according to the Drawings and specifications. No payment shall be made on standard manufactured items. The Architect's decision as to which category a specific item qualifies under shall be final.

9.3 SUBSTANTIAL COMPLETION

9.3.1 Substantial Completion. Revise to City of Pharr, TX.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY OF PERSONS AND PROPERTY

10.1.1 Protection of Plant Life: Solvents, oils and any other material which may be harmful to plant life shall be disposed of in containers as directed by the Architect and removed from the site. At completion of work, any contaminated soil shall be removed and replaced with good soil by this Contractor at no expense to the Owner.

10.1.2 The Contractor shall secure and pay for all necessary permits and shall comply with all ordinances pertaining to this work. He shall provide and maintain suitable temporary walkways, where needed, fences and other structures, required by law and city ordinances, in such a manner as not to interfere with traffic in public streets. He shall leave access to fire hydrants and protect the public and adjacent property at all times during the progress of the Contract. The proper signs shall be posted at truck entrances, and all other possible safety precautions observed.

10.1.3 The Contractor shall, as a cost of the Work, provide and maintain in good order, any firefighting equipment required by local authorities during Contract operations.

10.1.4 The Contractor shall immediately report to the Owner all accidents arising out of the Work and involving injury to employees of the Contractor, any member of the public or property damage to the property. The Owner's liability insurance will not be responsible for claims, accidents and losses arising out of the Contractor's operations.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1 CORRECTION OF WORK

The above stated ONE YEAR guarantee by the General Contractor may be extended to longer periods if stated in the “Specific Section of the Specifications".

Substitute "Date of Final Acceptance of the Project" in lieu of "Date of Substantial Completion" or "Substantial Completion". The date of Final Acceptance shall be the date of the Final Application of Payment is approved by the Architect.

12.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

"Appropriate reduction" is hereby defined as an amount equal to the entire cost of replacing the work to make it as originally shown or specified.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 AHERA

Pursuant to Federal Public Law 99-519, otherwise known as the Asbestos Hazard Emergency Response Act (AHERA) there shall be no asbestos containing products and/or materials used in this project.

OTHER CONDITIONS OR PROVISIONS

Contractor understands and agrees that time is of the essence hereof and in order to comply with Article 3 and meet all applicable completion dates, Contractor warrants and represents that Contractor will undertake proper coordination of the Work so as to not interfere, disrupt, delay or adversely affect in any way the on-going business functions and operations of the owner. Contractor understands and agrees that in order to comply herewith, it may be necessary for work to continue under this Contract on holidays, weekends and other calendar days on which Work is not ordinarily performed; cost of on holidays, weekends and other calendar days on which Work is not ordinarily performed; cost of which shall be by the Contractor.

All risk insurance described in Article 11, Section 11.1.1 shall be purchased and carried by the contractor. The additional cost for this insurance will be paid by the Owner.
The term Products is utilized throughout this Specification Manual to encompass the many other words often used in specifications they are defined in the paragraph below:

1. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

2. Furnish or Supply: To supply and deliver, unload, inspect for damage.

3. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, and ready for use.

4. Provide: To furnish or supply, plus install.

END OF SECTION

SECTION 00 92 00
PREVAILING WAGE LEGAL REQUIREMENTS

The Contractor's attention is called to Articles 5159A and 5160 of the Revised Civil statutes of Texas which Statutes must be complied with. These articles are as follows:

ARTICLE 5159A:

SECTION 1. Not less than the general prevailing rate of per diem wages for work of a similar character in the locality which the work is performed, and not less than the general prevailing rate of per diem wages for legal holiday and overtime work, shall be paid to all laborers, workmen and mechanics employed by or on behalf of any County, City and County, City, Town, District or other political subdivision of the State, engaged in the construction of public works, exclusive of maintenance work. Laborers, workmen and mechanics employed by contractors or subcontractors in the execution of any contract or contracts for public works with the State, or any officer or public body thereof, or in the execution of any contract or contracts for public works, with any County, City and County, City, Town, District or other political subdivision of this State, or any officer or public body thereof, shall be deemed to be employed upon public work.

SECTION 2. The public body awarding any contract for public work on behalf of the State, or on behalf of any County, City and County, City, Town, District or other political subdivision thereof, or otherwise undertaking any public work, shall ascertain the general prevailing rate of per diem wages in the locality in which the work is to be performed for each craft or type of workmen or mechanic needed to execute the contract, and shall specify in the call for proposals for said contract, and in the contract itself, what the general prevailing rate of per diem wages in the said locality is for each craft or type of workmen needed to execute the contract, also the prevailing rate for legal holiday and overtime work, and it shall be needed to execute the contract, also the prevailing rate for legal holiday and overtime work, and it shall be mandatory upon the Contractor to whom the contract is awarded, and upon any subcontractor under him, to pay not less than the said specified rates to all laborers, workmen and mechanics employed by them in the execution of the contract. The Contractor shall forfeit as a penalty to the State, County, City and County, City, Town, District or other political subdivision on whose behalf the contract is made or awarded, Ten Dollars ($10.00) for each laborer, workman or mechanic employed for each calendar day, or portion thereof, such laborer, workman or mechanic is paid less than the stipulated rates for any work done under said contract, by him, or by any subcontractor under him, and the said public body awarding the contract shall cause to be inserted in the contract a stipulation to this effect. It shall be the duty of such public body awarding the contract, and its agents and officers to take cognizance of complaints of all violations of the provisions of this Act committed in the course of the execution of the contract, and when making payments to the contractor of monies becoming due under said contract to withhold and retain therefrom all sums and amounts which shall have been forfeited pursuant to the herein said stipulation and the terms of this Act; provided, however, that no sum shall be so withheld, retained or forfeited, except from the final payment, without a full investigation by the awarding body. It shall be lawful for any contractor to withhold from any subcontractor under him sufficient sums to cover any penalties withheld from him by the awarding body on account of said subcontractor's failure to comply with the terms of this Act, and if payment has already been made to him the contractor may recover from him the amount of the penalty or forfeiture in a suit at law.

PREVAILING WAGE LEGAL REQUIREMENTS Continued:

SECTION 3. The contractor and each subcontractor shall keep, or cause to be kept, an accurate record showing the names and occupations of all laborers, workmen and mechanics employed by him, in connection with the said public work, and showing the actual per diem wages paid to each of such workers, which record shall be open at all reasonable hours to the inspection of the public body awarding the contract, its officers and agents.

SECTION 4. Any construction or repair work done under contract, and paid for in whole or in part out of public funds, other than work done directly by any public utility company pursuant to order of the Railroad Commission or other public authority, whether or not done under public supervision or direction or paid for wholly or in part out of public funds, shall be held to be "public works" within the meaning of political subdivision of this State in which the building, highway, road, excavation, or other structures, project, development or improvement is situated in all cases in which the contract is awarded by the State, or any public body thereof, and shall be held to mean the limits of the County, City and County, City, Town, District or other political subdivision on whose behalf the contract is awarded in all other cases. The term "general prevailing rate of per diem wages" shall be the rate determined upon as such rate by the public body awarding the contract, or authorizing the work, whose decision in the matter shall be final. Nothing in this act, however, shall be construed to prohibit the payment to any laborer, workman or mechanic employed on any public work as aforesaid of more than the said general prevailing rate of wages.

ARTICLE 5160. **Bond for Wages:**

Any person or persons, firm or corporation, entering into a formal contract with this State or its counties or school districts or other subdivisions thereof or any municipality therein for the construction of any public building, or the prosecution and completion of any public work shall be required, before, commencing such work, to execute the usual Penal Bond, with additional obligation that such contractor shall promptly make payments to all persons supplying him or them with labor and materials in the prosecution of the work provided for in such contract. Any person, company, or corporation who has furnished labor or materials used in the construction or repair or any public building or public work, and payment for which has not been made, shall have the right to intervene and be made a party to any action instituted by the State or any adjudicated in such action and judgment rendered thereon, subject, however, to the priority of the claims and judgment of the State or municipality.

If the full amount of the liability of the surety on said bond is insufficient to pay the full amount of said claims and demands, then, after paying the full amount due to the State or municipality, the remainder shall be distributed pro-rata among said interveners. Provided, further, that all claims for labor and materials furnished to said Contractor, and all claims for labor and material furnished to any contractor shall be itemized and sworn to as required by Statutes as to mechanic's lien claims, and such claims shall be filed with the County Clerk of the County, in which said work is being prosecuted, within ninety days from the date of the delivery of said material and the performance of said work. The County Clerk shall note on the mechanic's lien record, the name of the claimant, the amount claimed, the name of the contractor and the name of the county, School District, other subdivisions, or municipality with which the contract was made; and the County Clerk shall index the claim under the name of the contractor and under the name of the County, School District, other subdivision or municipality; with which the contract was made.

PREVAILING WAGE LEGAL REQUIREMENTS Continued:

ARTICLE 5160. **Bond for Wages Continued:**

Provided further, that after completion and acceptance of completed project all moneys due contractor under said contract shall be held by the state or its counties or school districts or other subdivision, thereof or an affidavit made by Contractor that all just bills for labor and material under this contract has been paid in full by the Contractor.
Acts 1913, P. 185; Acts 1929, 41st leg., P.4881. Ch. 22 paragraph 1.

General Decision Number: TX180305 09/14/2018 TX305

Superseded General Decision Number: TX20170305

State: Texas

Construction Type: Building

County: Hidalgo County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act or which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually.

Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018
1	09/14/2018

BOIL0074-003 01/01/2017

	Rates	Fringes
BOILERMAKER	$ 28.00	22.35

ENGI0178-005 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane	$ 29.00	10.60
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic Crane 60 tons and above	$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under	$ 27.50	10.60

---

* IRON0084-011 06/01/2018

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 23.77	7.12

PLUM0412-004 04/01/2013

	Rates	Fringes
PLUMBER	$ 31.14	12.43

SUTX2014-031 07/21/2014

	Rates	Fringes
BRICKLAYER	$ 16.17	0.00
CARPENTER	$ 14.21	2.22
CEMENT MASON/CONCRETE FINISHER	$ 12.46	0.00
ELECTRICIAN	$ 18.44	4.53
INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation)	$ 11.54	2.17
IRONWORKER, REINFORCING	$ 12.01	0.00
IRONWORKER, STRUCTURAL	$ 15.04	4.34
LABORER: Common or General	$ 8.00	0.00
LABORER: Mason Tender - Brick	$ 10.00	0.00
LABORER: Mason Tender - Cement/Concrete	$ 10.89	0.96
LABORER: Pipelayer	$ 11.00	3.47
LABORER: Roof Tearoff	$ 10.06	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 14.04	1.01
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 13.93	0.00
OPERATOR: Bulldozer	$ 18.29	1.31

OPERATOR: Drill.....$ 16.22 0.34

OPERATOR: Forklift.....$ 14.83 0.00

OPERATOR: Grader/Blade.....$ 10.00 0.00

OPERATOR: Loader.....$ 12.87 0.70

OPERATOR: Mechanic.....$ 17.00 0.00

OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....$ 16.03 0.00

OPERATOR: Roller.....$ 12.70 0.00

PAINTER (Brush, Roller, and Spray).....$ 11.27 0.00

PIPEFITTER.....$ 15.22 3.16

ROOFER.....$ 11.42 0.00

SHEET METAL WORKER (HVAC Duct Installation Only).....$ 18.40 2.12

SHEET METAL WORKER, Excludes HVAC Duct Installation.....$ 21.13 6.53

TILE FINISHER.....$ 11.22 0.00

TILE SETTER.....$ 12.15 0.00

TRUCK DRIVER: Dump Truck.....$ 12.39 1.18

TRUCK DRIVER: Flatbed Truck.....$ 19.65 8.57

TRUCK DRIVER: Semi-Trailer Truck.....$ 12.50 0.00

TRUCK DRIVER: Water Truck.....$ 12.00 4.11

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other

health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is
like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular
rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example:
PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and
non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is
based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISION

SECTION 01 01 00
GENERAL SCOPE OF WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: The Project generally consists of, but is not necessarily limited to, the following:

1. The project is approximately*72,796 square feet of new Aquatic Facility* with an alternate second level build out of 1,212 s.f., located *at* 3001 N. Cage Blvd., Pharr Texas 78577.

2. Site Work as noted in the Construction Documents

3. Includes Landscaping and Irrigation

4. Work of the Project includes the construction of the following as stated in Construction Documents and Project Manual dated 06/07/2019.

B. Work Not Included, must meet Requirements:

1. Furnishings.

1.02 CONTRACT DOCUMENTS

A. Requirements for all Work shall be executed in strict accordance with the following:

1. The Contract.

2. The Drawings.

3. The Approved Shop Drawings.

4. The General Conditions and Supplementary General Conditions.

5. The Specifications, Addenda and Bulletins.

6. The Change Orders and Directives received from the Owner and/or Architect.

7. Warranties and Guarantees in accordance with requirements of the Contract Documents, with period of Warranty as stated therein; except if Contractor neglects to correct or complete Work in Punch Lists during period of Warranty and/or Guaranty, Contractor is still responsible and required to do so after

expiration dates of Warranty or Guaranty until the corrective Work is completed and accepted by the Owner.

8. The governing Building Code, all governing laws, ordinances, rules, permits, regulations and directives from governing authorities having jurisdiction over this Work.

9. The approved Construction Time and Sequence Schedule.

10. Cooperation with other Contractors employed on the Project by the Owner under separate contracts. Cooperation shall include, but not be limited to, written notices to others when required to implement proper coordination of the Work and to maintain the Construction Time and Sequence Schedule.

B. Intent of Contract Documents: Work not particularly detailed, marked, or specified shall be the same as similar parts that are detailed, marked, or specified. Should an error occur in the Specifications or Drawings, or in Work by others affecting this Work, the Contractor shall at once notify the Architect who will issue instructions as to procedure. If the Contractor proceeds with the Work based on such an error without instructions from the Owner, the Contractor shall make good any resulting damage or defects. This includes Specification typographical errors and Drawing notational errors where the intent is doubtful.

C. Conflicts: In the event of a conflict or need for interpretation between the Working Drawings and Specifications, the Architect shall be the sole interpreter of the Drawings and Specifications, to determine which, if any will take precedence.

D. Requirements of Regulatory Agencies: Furnish and install materials in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction over this Project, including “ICC/ANSI - A117.1 - Standard for Accessible and Usable Buildings and Facilities”, “Title III of The Americans With Disabilities Act (ADA), Public Law 101-336” and TDI Texas Department of Insurance.

1.03 QUALITY ASSURANCE

A. Standards: All exterior building materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.

1.04 PROHIBITED SUSPENSION OF MATERIALS FROM METAL DECK

A. Suspension of any material or equipment from metal deck is strictly prohibited. Items not allowed to be attached to or suspended from the metal deck include but are not limited to mechanical or electrical equipment, ducts, piping, light fixtures, or other decorative structures.

1.05 HAZARDOUS MATERIALS

A. The building shall be free of hazardous materials according to applicable federal, state, and local environmental regulations.

1.06 ASBESTOS FREE MATERIALS

A. No asbestos, or products containing asbestos, shall be installed in this Project. General Contractor shall provide to the Owner at completion of construction, an affidavit certifying that the Project is free of all asbestos - containing materials.

1.07 ACCESS TO SITE

A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.08 WORK RESTRICTIONS

A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes.

PART 2 - PRODUCTS (NOT APPLICABLE)
PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 15 00
CONTRACT STANDARDS AND PROCEDURES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: This section consists of establishing standards and procedures.

1.02 OPERATIONS

A. Layout: Locate and layout the Work, and establish lines and levels accurately. Report any discrepancies to the Architect immediately upon discovery.

B. Use of Premises: Confine apparatus, storage of materials, and operations of workmen to limits indicated by law, ordinance, permit, or arrangement with the Owner. Do not unreasonably encumber the premises with materials.

C. Project Meetings:

1. Progress Meetings: Schedule and conduct regular periodic progress meetings. All Key personnel of contractor and subcontractors shall attend. Notify other parties as the Owner’s Representative or Architect might designate, as job conditions and progress might warrant.

a. Contractor’s Construction Schedule: Review progress since last meeting, determine whether each activity is on time, ahead schedule, or behind schedule, in relation to the Contractor’s construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that correct and subsequent activities will be completed within Contract Time.

1) Review schedule for next scheduled progress meeting period.

b. Agenda: Review present and future needs of each entity present, including the following:

1) Interface requirement.

2) Sequence of operations.

3) Status of submittals.

4) Deliveries.

5) Off-site fabrication.

6) Access and site utilization.

7) Temporary facilities and controls.

8) Progress Cleaning

9) Quality and work standards

10) Status of correction of deficient items.

11) Field observations.

12) Status of RFIs.

13) Status of proposal requests.

14) Pending changes and Status of Change Orders.

15) Pending claims and disputes.

16) Documentation of information for payment requests.

c. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

2. Preconstruction Meeting: Schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. All Key personnel of owner, design professionals and contractors shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Discuss items of significance that could affect progress, including the following:

1) Tentative construction schedule.

2) Phasing and Staging.

3) Critical work sequencing and long-lead items.

4) Designation of key personnel and their duties.

5) Lines of communications.

6) Procedures for processing field decisions and Change Orders.

7) Procedures for RFIs.

8) Procedures for testing and inspecting.

9) Procedures for processing Application for Payment.

10) Distribution of the Contract Documents.

11) Submittal procedures.

12) Preparation of record documents.

13) Use of the premises.

14) Work restrictions.

15) Working hours.

16) Owner's occupancy requirements.

17) Responsibility for temporary facilities and controls.

18) Procedures for moisture and mold control.

19) Procedures for disruptions and shutdowns.

20) Construction waste management and recycling.

21) Parking Availability.

22) Office, work, and storage areas.

23) Equipment deliveries and priorities.

24) First Aid.

25) Security.

26) Progress cleaning.

27) Safety.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

4. Preinstallation Meetings: Conduct a preinstallation meeting at Project site before each construction activity that requires coordination with other construction. All Key personnel of contractor, subcontractors, and manufacturer representative shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

1) Contract Documents.

2) Options.

3) Related RFIs.

4) Related Change Orders.

5) Purchases and Deliveries.

6) Submittals.

7) Review of Mockups.

8) Possible conflicts and Compatibility problems.

9) Time schedules and weather limitations.

10) Manufacturer's written recommendations.

11) Warranty requirements.

12) Compatibility of materials and acceptability of substrates.

13) Temporary facilities and controls.

14) Space and access limitations.

15) Regulations of authorities having jurisdiction.

16) Testing and inspecting requirements.

17) Installation procedures and coordination with other work.

18) Required performance results.

19) Protection of adjacent work, construction and personnel.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

5. Project Closeout Meetings: Schedule and conduct a Project closeout meeting, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion. All Key personnel of contractor, subcontractors, owner, and design professionals shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

1) Submission of record documents.

2) Procedures required prior to inspection for Substantial Completion and for Final inspections for acceptance.

3) Submittal of written warranties.

4) Requirements for preparing operations and maintenance data.

5) Requirements for demonstrations and training.

6) Preparation of Contractor's punch list.

7) Procedures for processing Applications for Payment at Substantial Completion and for final payment.

8) Submittal Procedures.

9) Coordination of separate contracts.

10) Owner's partial occupancy requirements.

11) Installation of Owner's furniture, fixtures, and equipment.

12) Responsibility for removing temporary facilities and controls.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

1.03 RECORDS

A. Record Drawings: Maintain on site a complete set of Construction Documents and Shop Drawings as required by Section 01 73 00 - Execution.

B. Construction Photographs: Refer to Sections 01 32 33 - Photographic Documentation.

1.04 SUBMITTALS

A. Subcontractor List: Submit list of subcontractors with addresses, telephone numbers and e-mail addresses for approval **at the time of Competitive Sealed Proposal Submission**. Prepare list on the form of a sworn statement attesting to the validity of such. Do not change the name of subcontractors or vendors on the approved list without the specific written form stating sufficient reason to warrant such a change.

B. Schedule of Values: Prepare detailed accounting of Contract Sum on the basis of "trades" Sections indicated in the Table of Contents. Submit and obtain approval before first application for payment. Use only approved breakdown for payment requests.

C. Payment Schedule: Submit to the Architect at least twenty (20) days prior to the submission of the first request for payment, a schedule detailing projected monthly requests for payment for the duration of the Project.

D. Shop Drawings and Samples:

1. Refer to Section 01 33 23 - Shop Drawings and Samples.

2. In addition to Section 01 33 23, the Contractor shall furnish the Owner with one (1) copy of all approved Shop Drawings and manufacturers product data bound in loose leaf form, for the Owner's records, prior to Owner issuing the Certificate of Substantial Completion.

E. Test Reports: Submit copies as required herein, with distribution as directed by the Architect.

1.05 DOCUMENTS

A. Performance and Labor and Material Payment Bonds:

1. If required, deliver to the Owner within ten (10) days of the date of the notification of intent to enter into Contract.

2. Condition bonds for the faithful performances of the Contract and for the payment of labor and material, each in the sum of 100% of the amount of the Contract as set forth in notification of intent to enter into Contract.

3. The Owner, at the Owner's discretion, reserves the right to accept or reject the company underwriting the bonds on the basis of their previous performance.

B. Agreement: General Contractor to Use and fill own AIA Form A111.

C. Application for Payment: Use AIA Form G702 and G703.

D. Sworn Statements: Use uniform commercial format designated by the Owner.

E. Insurance Certificate: Use form selected by Owner. Owner may, at the Owner's option, require a certified copy of Contractor's insurance policies in addition to insurance certificates.

1.06 QUALITY CONTROL

A. Standards: Establish a quality control system to perform sufficient inspection and tests of all Work, including subcontractors, to ensure conformance to applicable Specifications and Drawings, with respect to materials, workmanship, construction, finish, functional performance, and identification. Control system shall specifically include observation, supervision, and tests required in the Specifications.

B. Testing: Provide testing in accordance with Section 01 45 23 - Testing and Inspecting Services.

1.07 SCHEDULE

A. Dates: Work shall commence and be substantially completed as specified in the Contract Agreement.

B. Schedule:

1. Prepare a “Plan of Operations and Progress Schedule” to indicate the manner in which different phases of the Work are to be started, when Shop Drawings and submittals are to be submitted, colors selected, methods and speed for progressing different phase actions, and dates upon which subcontractors are dependent upon other sub-contracts. Schedule shall indicate major items of Work, including foundations, column footings, steel erection, floor finishes, underfloor plumbing and electrical Work, roof mounted HVAC equipment, concrete floor pours, partition Work, and date of Final Completion.

2. Plan of Operations and Progress Schedule shall be “weighted” to schedule each trade in proportion to the entire Project, physically and financially.

3. Revise schedule monthly to indicate actual progress compared to the estimated progress.

4. Post schedule in the Contractor’s field office and distribute copies to the Owner, Architect, Project Representative, and all prime Subcontractors.

1.09 PAYMENT

A. Requests:

1. On or before the tenth (10th) day of each month, the Contractor shall make application for payment in quadruplicate based on percentage of completion of items of cost breakdown.

2. Each application after the first one shall be accompanied by waivers of lien and sworn statements that all labor, materials, and services included in the previous and prior statements have been paid, less only the retained percentage stated herein, and any disputed amounts which shall be stated. In addition, the Contractor shall request and file with the request for payment a sworn statement from each Subcontractor that the Contractor has direct contractual relations with.

B. Payment: The Owner shall make payments on account of each contract as provided herein. Within thirty (30) days after submission and approval of the application for payment the Owner will pay ninety (90) percent of the value except as may be modified as follows, based on the Contract prices, including executed change orders amending the Contract, on labor and materials incorporated in the Work, and material suitably stored at the site up to the first

day of that month as certified by the Architect, less the aggregate of the previous payments.

C. Retained Percentage:

1. Five (5) percent of the estimated amounts shall be retained until the final completion and acceptance of all Work covered by the Contract.

2. The retained percentage shall be paid thirty (30) days after Owner's acceptance of the building, providing that all requirements of the Contract are met. Refer to Closing Procedure.

D. Substantial Completion Payment: Upon issuance of Certificate of Substantial Completion, a sum shall be paid sufficient to increase the payments to the total of the Contract, less the retained percentage.

E. Final Certificate:

1. After the Contractor has complied with the closing requirements specified herein, and provided the Architect with appropriate documentation, the Architect shall certify such, issuing a Final Certificate.

2. Issuance of such Certificate does not relieve the Contractor of the responsibilities related to guaranteeing the performance of the facility, as specified herein or otherwise provided.

1.10 CLEANING

A. Keep the premises free from accumulation of waste materials or rubbish caused by Work operations at all times. At the completion of the Work remove all waste materials and rubbish from and about the Project, as well as all tools, construction equipment, machinery, and surplus materials.

B. Establish and enforce a daily system for collecting and disposing waste materials from construction areas and elsewhere at Project site. Do not hold collected materials at site for more than three (3) days. Handle hazardous, dangerous, unsanitary, contaminating, pollution and similar harmful wastes separately from inert materials by containerizing in an appropriate manner. Dispose of each category of waste material in a lawful manner. Do not bury or burn waste materials on Owner's property.

1.10 CLOSING PROCEDURES

A. Financial:

1. Furnish ample evidence to Architect and Owner that all financial obligations have been met, including sworn statements and final waivers of lien.

2. Obtain a written statement releasing the Owner and the Architect from any and all obligations which might arise out of any unpaid, defaulted, or otherwise unsatisfied accounts.

B. Punch List:

1. Complete and correct all items on the Punch List as originally issued, and amended.

2. If contemplating application for final payment, schedule a joint inspection visit to the Project with the Architect one (1) week in advance to determine if the Contracts have been fully executed.

C. Record Drawings: Deliver not less than three (3) sets of documents to the office of the Architect and a PDF file.

D. Warranties and Guarantees:

1. Submit all written warranties and guarantees.

2. Submit as applicable, list of contacts, including company name, personal contact, address, telephone number, and e-mail address for building equipment and components which may require periodic service, including roofing, power actuated doors, mechanical equipment, fire protection, plumbing, and electrical equipment.

C. Other Documents:

1. Furnish reports of all tests and the performance of completed systems, as required in the Specifications, and all certificates of approval.

2. Furnish all schedules, instructions, and equipment operation and service manuals as necessary to ensure safe and proper operation and maintenance of products installed in the building.

E. Final Certificate: Issuance of Final Certificate does not relieve the Contractors of the responsibilities related to warranting and guarantying the performance of the Work.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of values.

B. Applications for payment.

C. Change procedures.

D. Defect assessment.

1.2 SCHEDULE OF VALUES

A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance.

D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

E. Include separately from within each line item, a direct proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, with each Application for Payment.

1.3 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 – Continuation Sheet.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Submit an updated construction schedule with each Application for Payment.

D. Payment Period: Submit at intervals stipulated in the Agreement.

E. Submit with transmittal letter as specified for Submittals in Section 01 33 00.

F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with the application:
   1. Current construction photographs specified in Section 01 32 33.
   2. Partial release of liens from major subcontractors and vendors.
   3. Execution documents as specified in Section 01 70 00, for review by the Owner which will be returned to the Contractor.
   4. Affidavits attesting to off-site stored products.
   Construction progress schedules, revised and current as specified in Section 01 33 00.

1.4 CHANGE PROCEDURES

A. Submittals: Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.

C. The Architect/Engineer may issue a Proposal Request or Notice of Change, which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit an estimate within 15 days.

D. The Contractor may propose changes by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01 60 00.

E. Construction Change Directive: Architect/Engineer may issue a directive, on AIA Form G713 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

F. Force Account Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer will determine the change

allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

G. Maintain detailed records of work done on Force Account basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

H. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

I. Change Order Forms: AIA G701, AIA G701/CM Change Order.

J. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

K. Correlation of Contractor Submittals:
1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.
2. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
3. Promptly enter changes in Project Record Documents.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct an appropriate remedy or adjust payment.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of the Architect/Engineer and Owner to assess the defect and identify payment adjustment, is final.

E. Non-Payment for Rejected Products: Payment will not be made for rejected products for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Quantity allowances.
3. Contingency allowances.
4. Testing and inspecting allowances.

C. Related Requirements:
1. Section 01 40 00 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight**,** and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner and/or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

D. All Allowances remaining balance at the end of the project shall be returned/credited back to the Owner.

E. The allowance shall appear on the schedule of value as a line item.

1.8 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No.1: General Contractor to provide $15,000.00 (Fifteen Thousand U.S. Dollars) for Architectural Design Contingency Allowance.

B. Allowance No.2: General Contractor to provide $70,000.00 (Seventy Thousand U.S. Dollars) for MEP Allowance Commissioning IECC 2015.

C. Allowance No.3: General Contractor to provide $35,000.00 (Thirty Five Thousand U.S. Dollars) for MEP Allowance Test and Balance.

D. Allowance No.4: General Contractor to provide $83,000.00 (Eighty Three Thousand U.S. Dollars) for Structural Allowance of Concrete, Reinforcing Steel, Structural Steel, and CMU. Refer Allowance note on Structural Drawings.

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 23 00 "Alternates and Separate Prices" for products selected under an alternate.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Industry Standard Form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES, NFPA, end related codes adopted by the local City.

j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.

f. Requested substitution has been coordinated with other portions of the Work.

g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.

g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.

i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 25 50
CHANGE ORDER PROCEDURES

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Procedures for processing Change Orders, including:

1. Assignment of a responsible individual for approval and communication of changes in the Work;

2. Documentation of change in Contract Price and Contract Time;

3. Change procedures, using proposals and Modifications;

4. Execution of Change Orders;

5. Correlation of Contractor submittals.

1.02 REFERENCES

A. Blue Book is defined as the Rental Rate Blue Book for Construction Equipment (a.k.a. Data Quest Blue Book).

B. Rental Rate is defined as the full-unadjusted base rental rate for the appropriate item of construction equipment.

1.03 RESPONSIBLE INDIVIDUAL

A. Provide a letter indicating the name and address of the individual authorized to execute Modifications, and who will be responsible for informing others in Contractor's employ and Subcontractors of changes to the Work. Provide this information at the pre-construction meeting.

1.04 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

A. Maintain detailed records of changes in the Work. Provide full information required for identification and evaluation of proposed changes, and substantiate costs of changes in the Work.

B. Document each proposal for change in Contract Price or Contract Time with sufficient data to

allow evaluation of proposal.

C. Include the following minimum information on proposals:

1. Quantities of items in original Bid Form with additions, deductions, deletions, and substitutions.

2. Quantities and cost of items in original Schedule of Values with additions, reductions, deletions and substitutions.

3. Justification for changes in Contract Time.

4. Additional data upon request.

D. For changes in the Work performed on a time-and-material basis, provide the following additional information:

1. Quantities and description of Products.

2. Taxes, Insurance and Bonds.

3. Overhead and profit as noted in General Conditions.

4. Dates, times and by who work was performed.

5. Time records and certified copies of applicable payrolls.

6. Invoices and receipts for Products, rental equipment, and subcontracts, similarly documented.

E. For changes in the Work performed on a time-and-materials basis, rental equipment is paid as follows:

1. Actual invoice cost for duration of time required to complete extra work without markup for overhead and profit. When extra work comprises only a portion of a rental invoice where equipment would otherwise be on site, compute hourly equipment rate by dividing the actual monthly invoice by 176. One day equals eight hours and one week equals 40 hours.

2. Do not exceed estimated operating costs given in Blue Book for items of equipment. Overhead and profit will be allowed on the operating cost.

F. For changes in the Work performed on a time-and-materials basis using Contractor-owned equipment, use Blue Book rates as follows:

1. Contractor-owned equipment will be paid at the Blue Book Rental Rate for the time required to complete extra work without markup for overhead and profit. Utilize lowest cost combination of hourly, daily, weekly or monthly rates. Use 150 percent of Rental Rate for double shifts, one extra shift per day, and 200 percent of Rental Rate for more than two shifts per day. Standby rates shall be 50 percent of the appropriate Rental Rate shown in Blue Book. No other rate adjustments apply.

2. Do not exceed estimated operating costs given in Blue Book. Overhead and profit will be allowed on operating costs. Operating costs will not be allowed for equipment on standby.

1.05 CHANGE PROCEDURES

A. Changes to Contract Price or Contract Time can only be made by issuance of Change Order. Issuance of Work Change Directive will be formalized into a Change Order.

B. Engineer will advise of Minor Changes in the Work.

C. Request clarification of Drawings, Specifications, Contract documents or other information by using Request for Information form. Response by Engineer to Requests for Information does not authorize Contractor to perform tasks outside scope of the Work. Changes must be authorized as described in this Section.

1.06 PROPOSALS AND CONTRACT MODIFICATIONS

A. Engineer may issue a Request for Proposal, which includes a detailed description of the proposed change with supplementary or revised Drawings and Specifications. Engineer may also request a proposal in response to a Request for Information. Prepare and submit the proposal within seven days or as specified in request.

B. Submit requests for Contract changes to Engineer describing proposed change and its full effect on the Work, with a statement describing reason for change and effect on Contract Price and Contract Time including full documentation.

C. Design Consultant may review Change Orders.

1.07 WORK CHANGE DIRECTIVE

A. Engineer may issue a signed Work Change Directive instructing Contractor to proceed with a change in the Work. Work Change Directive will subsequently be incorporated into a Change Order.

B. Work Change Directives will describe changes in the Work and designate the method of determining change in Contract Price or Contract Time.

C. Proceed promptly to execute changes in the Work in accordance with the Work Change Directive.

1.08 STIPULATED PRICE CHANGE ORDER

A. A Stipulated Price Change Order will be based on an accepted proposal.

1.10 TIME-AND-MATERIAL CHANGE ORDER

A. Provide itemized account and supporting data after completion of change, within time limits indicated for claims.

B. Engineer will determine the change allowable in Contract Price and Contract Time.

C. Maintain detailed records for work done on time-and-material basis as specified in Paragraph 1.04 above.

D. Provide full information required for evaluation of changes and substantiate costs for changes in the Work.

1.11 EXECUTION OF CHANGE DOCUMENTATION

A. Engineer will issue Change Orders, Work Change Directives, or Minor Change in the Work for signatures of Parties.

1.12 CORRELATION OF CONTRACTOR SUBMITTALS

A. For Stipulated Price Contracts, promptly revise Schedule of Values and Application for Payment forms to record authorized Change Orders as separate line item.

B. Promptly revise progress schedules to reflect change in Contract Time, and to adjust time for other items of work affected by the change, and resubmit for review.

C. Promptly enter changes to on-site and record copies of Drawings, Specifications or Contract documents as required in Section 01785 - Project Record Documents.

PART 2 P R O D U C T S - Not Used
PART 3 E X E C U T I O N - Not Used

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment

requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 010100 "General Scope of Work."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 as form for Applications for Payment.

D. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or proceeded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.

J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Field engineering.

C. Pre-construction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Pre-installation meetings.

G. Equipment electrical characteristics and components.

H. Cutting and patching.

I. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work, which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place
runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of project and acceptable to Architect/Engineer.

B. Contractor shall locate and protect survey control and reference points. Promptly notify Architect/Engineer of any discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a copy of site drawing and certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

G. Maintain a complete and accurate log of control and survey work as it progresses.

H. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

J. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.4 PRECONSTRUCTION MEETING

A. Owner and Architect/Engineer will schedule a meeting after Notice of Award.

B. Attendance Required: Owner, Architect/Engineer, and Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties in Contract, Owner and the Architect/Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Scheduling activities of a Geotechnical Engineer.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

A. Architect/Engineer and Owner will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required: Owner, Architect/Engineer, Special Consultants, Contractor, Contractor's Superintendent, and major Subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distributes copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Contractor shall coordinate with Architect/Engineer arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems, which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

E. Record minutes and distributes copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.7 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, Work of the specific section.

C. Notify Architect/Engineer seven days in advance of meeting date.

D. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Motors: Specific motor type is specified in individual specification sections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

C. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements which affect:
1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with applicable codes, to full thickness of the penetrated element.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection, for an assembly, refinish entire unit.

K. Identify hazardous substances or conditions exposed during the Work to the Architect/Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.

B. Employ skilled and experienced installer to perform alteration work.

C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

D. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

E. Remove debris and abandoned items from area and from concealed spaces.

F. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

H. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring products and finishes to specified condition.

I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

J. Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

K. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Architect/Engineer for review.

L. Where a change of plane of ¼ inch or more occurs, submit recommendation for providing a smooth transition; to Architect/Engineer for review.

M. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

O. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.

2. Coordination drawings.

3. Requests for Information (RFIs).

4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

2. Section 017000 "Project Closeout" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Preinstallation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.

g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.

4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.

    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.

    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.

    d. Location of pull boxes and junction boxes dimensioned from column center lines.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

    1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

    2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

    1. Project name.

    2. Project number.

    3. Date.

    4. Name of Contractor.

5. Name of Architect and Construction Manager.

6. RFI number, numbered sequentially.

7. RFI subject.

8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.

10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

12. Contractor's signature.

13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.

    b. Requests for approval of substitutions.

    c. Requests for approval of Contractor's means and methods.

    d. Requests for coordination information already indicated in the Contract Documents.

    e. Requests for adjustments in the Contract Time or the Contract Sum.

    f. Requests for interpretation of Architect's actions on submittals.

    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal.

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly include the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect and Construction Manager.

4. RFI number including RFIs that were returned without action or withdrawn.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's and Construction Manager's response was received.

E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT WEB SITE

A. Use Project Website for purposes of hosting and managing project communication and documentation until Final Completion when file size surpasses e-mail max attachment limit, and when otherwise directed by Architect.

B. Contractor, subcontractors, and other parties granted access by Contractor to Project Website shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the specifications.

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.

2. Periodic construction photographs.

3. Final Completion construction photographs.

1.02 SUBMITTALS

A. Construction Photographs: Submit digital photographs 14 days of taking photographs and digital copies with the monthly application for payment.

1. Format: 3x5 inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.

2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.

b. Name and address of photographer.

c. Name of Architect.

d. Name of Contractor.

e. Date photograph was taken if not date stamped by camera.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

g. Unique sequential identifier.

3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Film Images:

1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Architect.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.

D. Preconstruction Photographs: Before commencement of construction the contractor shall document in digital photographs the project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take color, digital photographs monthly, coinciding with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

1. Do not include date stamp.

G. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.

2. In emergency situations, take additional photographs within 24 hours of request.

3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.

b. Immediate follow-up when on-site events result in construction damage or losses.

c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.

d. Substantial Completion of a major phase or component of the Work.

e. Extra record photographs at time of final acceptance.

f. Owner's request for special publicity photographs.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Product data.

E. Shop drawings.

F. Samples.

G. Design data.

H. Test reports.

I. Certificates.

J. Manufacturer's instructions.

K. Manufacturer's field reports.

L. Erection drawings.

M. Construction photographs.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

G. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Architect/Engineer review stamps.

I. When revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit preliminary outline Schedules within 15 days after date established in Notice to Proceed for coordination with Owner's requirements. After review, submit detailed schedules within 15 days modified to accommodate revisions recommended by Architect/Engineer.

B. Submit revised Progress Schedules with each Application for Payment.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. Submit a computer generated horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.

F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

G. Indicate estimated percentage of completion for each item of Work at each submission.

H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and products identified under Allowances, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

I. Indicate delivery dates for Owner furnished products and products identified under Allowances.

J. Revisions to Schedules:
1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
3. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.

1.4 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents. Provide copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01700.

B. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect/Engineer.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Submit in the form of one reproducible transparency and one opaque reproduction.

1.7 SAMPLES

A. Samples: Submit to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.

B. Samples for Selection as Specified in Product Sections:
1. Submit to Architect/Engineer for aesthetic, color, or finish selection.
2. Submit samples of finishes from the full range of manufacturers' standard colors, in custom colors selected, textures, and patterns for Architect/Engineer selection.
3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00.

C. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Include identification on each sample, with full Project information.

E. Submit the number of samples specified in individual specification sections; one of which will be retained by Architect/Engineer.

F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

G. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.8 DESIGN DATA

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.9 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the Owner.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.10 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect/Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit report in duplicate within 30 days of observation to Architect/Engineer for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

1.14 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect/Engineer.

B. Twice monthly submit photographs with Application for Payment.

C. Photographs: One print color, glossy; 8 X 10 inch size; mounted on 8-1/2 X 11 inch soft card stock, with left edge binding margin for three hole punch.

D. Take two site photographs from differing directions and five interior photographs of indicating the relative progress of the Work, five days maximum prior to submitting.

E. Take photographs as evidence of existing project conditions as follows:
1. Interior views: five.
2. Exterior views: five.

F. Identify each print on back. Identify name of Project, contract number, phase, orientation of view, date and time of view, name and address of photographer, and photographer's numbered identification of exposure.

G. Deliver negatives to Owner with project record documents. Catalog and index negatives in chronological sequence; provide typed table of contents.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 33 23
SHOP DRAWINGS AND SAMPLES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SUBMITTALS

A. Summary Listing and Schedule: General Contractor shall prepare a summary listing and schedule for submission of Shop Drawings, Samples, and Product Data to the Architect for review of the various items of Work. Schedule shall allow approximately two (2) calendar weeks or ten (10) working days for review; however, this may vary depending upon the quantity of the material submitted. Schedule shall also allow time for submission of Shop Drawings, Samples, and Brochures which may not be approved.

B. Substitution Requests: Submit four copies of each request for consideration. Indentify product or fabrication or installation method to be replaced. Include specification section number and title and drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the work and to construction performed by owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of signification qualities of proposed substitution with those of the work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirement included. Indicate deviations, if any, from the work specified.

d. Product Data, including drawings and descriptions of product and fabrications and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the work, including effect on overall contract time. If specified product or method of construction cannot be provided within contract time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

i. Cost information, including a proposal of change, if any, in contract sum.

j. Contractor's certification except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through General Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

c. Conditions of Acceptance: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

(1) Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

(2) Requested substitution does not require extensive revisions to the contract documents.

(3) Requested substitution is consistent with the contract documents and will produce indicated results.

(4) Substitution request is fully documented and properly submitted.

(5) Requested substitution will not adversely affect Contractor's construction schedule.

(6) Requested Substitution has received necessary approvals of authorities having jurisdiction.

(7) Requested Substitution is compatible and has been coordinated with other portions of the work.

(8) Requested Substitution provides specified warranty.

(9) If requested Substitution involves more than one contractor, requested substitution has been coordinated with other products, and is acceptable to all contractors involved.

C. Submittals: Each Subcontractor shall submit through the General Contractor, to the Architect at proper times, all Shop Drawings, Product Data, and setting diagrams which the Architect may deem necessary to illustrate the Work intended or show its relation to Work of other trades. Shop Drawings and Product Data shall contain manufacturer's name, material description, sizes and dimensions, and other pertinent information. All submittals, including resubmittals, shall have Product Data identifying the materials to be supplied by circling or denoting the intended materials on the Product Data sheets.

1. Prohibited Submittals: Contractors shall not duplicate Design/Working Drawings for use as Shop Drawings. Duplicated Drawings of this nature shall be rejected.

2. Required Information: Include in submittals sufficient drawings, plans, elevations, sections, performance data, dimensions, bolt locations, inserts, sound data, weights and schematics to clearly describe the equipment and to show compliance with the Specifications. Provide a cover or title sheet for each submittal containing the following:

a. Name of Contractor originating the submittal.

b. Name of Project for which the submittal is made.

c. An index of all items submitted.

d. Identification of each item of material and equipment.

e. Date of submittal.

f. Contractor's certification.

D. Deviations: Any and all deviations from the Specifications and/or Drawings must be brought to the Architect's attention by circling all items submitted for review.

E. Identification: Shop Drawing submittals and transmittal letters shall be identified with title and location of Project, names of the Architect, the Contractor, and the submission date.

F. Compliance Review: All Shop Drawings and Product Data submitted to the Architect shall be stamped by the General Contractor to indicate that the submittal has been reviewed for compliance with the Contract Documents, coordination between other Trade Work, and related details.

G. Reimbursement of Architect's Costs:

1. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by the Architect and the Architect's consultants in evaluation of each proposed substitution.

2. Whether or not the Architect approves a proposed substitution, the Contractor shall promptly upon receipt of the Architect's billing, reimburse the Architect at the rate of two and three-quarter (2-3/4) times the direct cost of the Architect and the Architect's consultants for all time spent in evaluating the proposed substitution.

H. Architectural and Structural Shop Drawings: The General Contractor shall submit to the Architect, for review, one (1) reproducible and three (3) prints of each Drawing.

1. If the Shop Drawings are returned "Revise & Resubmit", the effected Contractor shall correct the original Drawings and resubmit the Shop Drawings as originally required, i.e., one (1) reproducible and three (3) prints, to the Architect for review, file, and distribution.

2. Submit six (6) copies of Product Data such as catalog cuts and brochures.

I. Mechanical and Electrical Shop Drawings: Submit for review six (6) copies of all equipment and products in a brochure type format.

J. Required Shop Drawings: Shop Drawings are required for, but are not necessarily limited to the items as required by the Drawings and/or Specifications within the Project Manual.

K. Review of Shop Drawings:

1. It shall be distinctly understood that the review of Shop Drawings shall be for General Scheme only. Review does not relieve the Contractor from the necessity of correcting, without charge, details on the Drawings and completed Work found deficient in strength or otherwise faulty.

2. The Architect assumes no responsibility for “figured dimensions” of Shop Drawings.

3. The review of Shop Drawings does not relieve or modify the responsibility for compliance with the Contract Documents or dimensions or errors contained in the submittal or quantity count. It is clearly understood that in the review process, noting of some discrepancies, but overlooking others, does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, layout drawings, catalog data and brochures, the Contract Documents govern the Work, and are neither waived nor suspended in any way by the review of Shop Drawings, layout drawings, catalog data and brochures.

4. Upon completion of the Project the Owner shall be given one (1) set of reviewed Shop Drawings.

L. Authorization: Unless specifically otherwise required by the Architect and the Owner, no materials shall be ordered, delivered, fabricated, or erected until the proper written review by the Architect has been received by the General Contractor.

1.02 SAMPLES AND LETTERS OF INTENT

A. Summary Listing: General Contractor shall prepare a summary listing of the Samples and Letters of Intent submittal requirements for review by the Architect and the Owner’s Supervising Engineer.

B. Material Samples and Letters of Intent: Samples and Letters of Intent as listed and requested in the respective trade Specifications enumerate, but do not necessarily limit, the material Samples or Letters of Intent indicating materials, specifications, and/or installation procedures, which shall be submitted for approval PRIOR to purchase or installation of materials. All material Samples shall be reviewed by the Architect, and/or Owner PRIOR to erection or fabrication.

C. Samples: Submit to Architect for review, four (4) actual Samples of all materials to be used in the Work. All Samples shall have the same finish as that to be used in the completed Work. Manufacturer’s color charts and/or color swatches shall not be acceptable as Samples. Samples shall be accompanied by a letter requesting approval and presenting all required data.

D. Materials: All materials furnished shall be fully equal to the reviewed Samples.

E. Selections: Where the choice of more than one make or style of article or material is specified, the final selection of the article or material shall be made by the Owner.

F. Quality, Fitness, and Workmanship: The quality or fitness of materials or workmanship shall be based on the requirements that all Work done or materials furnished shall be first class in every respect, and what is usual or customary on other projects shall in no way enter into any consideration or decision.

G. Differences in Price: Where any difference occurs in price of such articles or materials, such differences are to be given before the Contracts are signed. After the Contracts have been signed, the Owner reserves the right to choose whichever article or material the Owner desires, assuming, unless previously advised to the contrary, the price is not changed thereby. Where the Specifications require a specific item “equal or comparable products” or other words to that effect, the final selection will be by the Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Mock-up requirements.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

1.6 TESTING AND INSPECTION SERVICES

A. Owner will employ services of an independent firm to perform testing and inspection. Contractor shall pay for services.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by the Architect/Engineer and Owner, or Authority having jurisdiction.
   1. Laboratory: Authorized to operate in location in which Project is located.
   2. Laboratory Staff: Maintain a full time specialist on staff to review services.
   3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing or re-inspection will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

H. Agency Responsibilities:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
6. Perform additional tests required by Architect/Engineer.
7. Attend preconstruction meetings and progress meetings.

I. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer and to Contractor. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

J. Limits On Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume any duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect/Engineer and Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01330 - SUBMITTAL PROCEDURES, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 23
TESTING AND INSPECTING SERVICES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included:

1. Owner will obtain the services of an Independent Testing Laboratory to perform testing services for concrete, steel and other materials as required, specified or directed. The Testing Laboratory shall evaluate and approve all soils testing performed by the Project Soils Engineer.

2. Requirements for testing are described in various sections of the Specifications. Where no testing requirements are described, but the Owner determines that testing is required, the Owner may require testing to be performed under currently recognized standards for testing.

B. Related Work:

1. Selection of Testing Laboratory: The Owner will select and approve a qualified, unbiased, and recognized independent commercial testing agency.

2. Payment for Initial Testing Services: The Owner will pay for all initial services of the testing agency as specified in Article

1.02 CODES AND STANDARDS

A. Testing, when required, shall be in accordance with all pertinent codes and regulations, and with selected ASTM International Standard Specifications.

1.03 TEST REPORTS AND RELATED INSTRUCTIONS

A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay to progress of the Work.

1.04 PAYMENT FOR TESTING SERVICES

A. Initial Services: The Owner will pay for all initial testing services. When the initial tests indicate non-compliance with the Contract Documents, the costs of all initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.

B. Retesting: When the initial tests indicate non-compliance with Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same agency, and the costs thereof will be deducted by the Owner from the Contract Sum.

1.05 CODE COMPLIANCE TESTING

A. Responsibility of Inspection and Testing: Inspection and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities or a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.06 TESTING LABORATORY DUTIES

A. Cooperation: Cooperate with Architect/Engineer and Contractor; provide qualified personnel after due notice.

B. Perform Specified Inspections, Sampling and Testing of Materials and Methods of Construction:

1. Take all specimens and samples.

2. Provide all sampling equipment and personnel.

3. Make all deliveries of specimens and samples to the Testing Laboratory.

4. Comply with specified standards.

5. Ascertain compliance of materials, and Work, with requirements of Contract Documents.

C. Irregularities and Deficiencies: Immediately notify Architect/Engineer, Owner's Supervising Engineer, and Contractor of observed irregularities or deficiencies of Work or products in the field or laboratory as a result of testing. All irregularities and deficiencies encountered shall not go unresolved. Testing reports submitted to Architect/Engineer shall be for file purposes only and shall include the resolution of these irregularities and/or deficiencies.

D. Reports of Tests and Inspections: Promptly submit written report of each test and inspection; one (1) copy each to Owner's Supervising Engineer, Owner, and Contractor, and three (3) copies to Architect/Engineer. Each report shall include:

1. Date issued.
2. Detailed listing.
3. Project title and number.
4. Testing Laboratory name, address and telephone number.
5. Name and signature of laboratory inspector.
6. Date and time of sampling or inspection.
7. Record of temperature and weather conditions.
8. Date of test.
9. Identification of product and Specification section.
10. Location of sample or test in the Project.
11. Name of person taking sample or making test.
12. Type of inspection or test.
13. Results of tests and compliance with Contract Documents.
14. Interpretation of test results, when requested by Architect/Engineer.

E. Additional Tests: Perform additional tests as required by Architect/Engineer, Owner's Supervising Engineer, or Owner.

F. Special Inspections: Submit "Statement of Special Inspections" and a certified written report of each special inspection, test or similar service; one (1) copy each to Owner's Supervising Engineer, Owner, and Contractor, and three (3) copies to Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs.

1. Report Data: Written inspection or test reports for the Project shall include, but shall not necessarily be limited to applicable special inspections listed below:

    a. Inspection of Fabrication per Building Code Section 1704.2, and as required by Structural Drawings.

    b. Inspection of Steel Construction per Building Code Section 1704.3, and as required by Structural Drawings.

    c. Inspection of Concrete Construction per Building Code Section 1704.4, and as required by Structural Drawings.

    d. Inspection of Masonry Construction per Building Code Section 1704.5, and as required by Structural Drawings.

    e. Inspection of Soils per Building Code Section 1704.7, and as required by Structural Drawings.

    f. Inspection of Pier Foundations per Building Code Section 1704.9, and as required by Structural Drawings.

    g. Inspection of Wall Panels and Veneers (seismic) per Building Code Section 1704.10, and as required by Structural Drawings.

    h. Inspection of Exterior Insulation and Finish Systems (EIFS) per Building Code Section 1704.12.

1.07 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the Work.

3. Perform any duties of the Contractor.

1.08 CONTRACTOR'S RESPONSIBILITIES

A. General: Cooperate with laboratory personnel, provide access to Work, to material manufacturer’s operations.

B. Samples: Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Preliminary Design Mixes: Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the Testing Laboratory.

D. Test Reports: Furnish copies of Products test reports as required.

E. Furnish Incidental Labor and Facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

F. Notification to Laboratory: Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

G. Contractor's Convenience Testing: For testing performed exclusively for Contractor's convenience, employ and pay for the services of a separate, equally qualified Independent Testing Laboratory.

H. Payment for Testing Services: Pay for services of Owner selected Testing Laboratory to extent previously specified in Article 1.04 PAYMENT FOR TESTING SERVICES.

1.09 SCHEDULES FOR TESTING

A. Time Required for Testing: By advance discussion with the testing agency selected by the Owner, determine the time required for the testing agency to perform its tests and to issue each of its findings. Provide all required time within the construction schedule.

B. Changes in Construction Schedules: When changes of construction schedules are necessary during construction, coordinate all such changes of schedules with the testing agency as required.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Temporary heating.
4. Temporary cooling.
5. Temporary ventilation.
6. Telephone service.
7. Facsimile service.
8. Temporary water service.
9. Temporary sanitary facilities.

B. Construction Facilities:
1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.

C. Temporary Controls:
1. Barriers.
2. Enclosures and fencing.
3. Protection of the Work.
4. Security.
5. Water control.
6. Dust control.
7. Erosion and sediment control.
8. Noise control.
9. Pest control.
10. Pollution control.
11. Rodent control.

D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Provide temporary electric feeder from electrical service at location as directed.

C. Power Service Characteristics: To allow service and lighting

by means of construction-type power cords.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
   1. Provide 20 ampere duplex outlets, single phase circuits for power tools as required to accommodate of active work area.
   2. Provide 20 ampere, single phase branch circuits for lighting.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve proper working visibility.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain H.I.D. lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may [not] be utilized during construction.

1.4 TEMPORARY HEATING

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain minimum ambient temperature of 50 degrees in areas where construction is in progress, unless indicated otherwise in product sections.

1.5 TEMPORARY COOLING

A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain maximum ambient temperature of 80 degrees in areas where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.7 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office and Architect/Engineer's field office at time of project mobilization.

1.8 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office and Architect/Engineer's field office at time of project mobilization.

1.9 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide at time of project mobilization.

1.11 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

C. Provide separate work station, similarly equipped and furnished, for use of Architect/Engineer and Owner.

D. Locate offices and sheds a minimum distance of 30 feet new structure.

E. Permanent facilities shall not be used for field offices or for storage.

F. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
   1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove when no longer needed.
   2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
   3. Exterior Materials: Weather resistant, finished in color acceptable to Architect/Engineer.
   4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
   5. Lighting for Offices: 50 foot candle at desk top height, exterior lighting at entrance doors.
   6. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.
   7. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

G. Environmental Control:
   1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions.
   2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; adequate lighting for maintenance and inspection of products.

H. Owner And Architect/Engineer Office:
   1. Separate space for sole use of Owner and Architect/Engineer, with separate entrance door with new lock and two keys.
   2. Area: Minimum 150 sq ft, minimum dimension 10 ft.
   3. Windows: Minimum three minimum total area of 10 percent of floor area, with operable sash and insect screens. Locate to provide views of construction area.
   4. Electrical Distribution Panel: Two circuits minimum, 110 volt, 60 hz service.
   5. Minimum four 110 volt quadraplex convenience outlets, one on each wall.
   6. Telephone: As specified in Section 01500.
   7. Sanitary Facilities: Convenient access to lavatory toilet facilities.
   8. Drinking Fountain: Convenient access by workers.
   9. Owner and Architect/Engineer Office Furnishings:
      a. One 30 x 60 inch, with three drawers.
      b. One drafting table 36 x 72 inch, with one equipment drawer and a full width parallel straight edge.

c. One metal, double-door storage cabinet under table.
d. Plan rack to hold working Drawings, shop drawings, and record documents.
e. One standard four-drawer legal - size metal filling cabinet with locks and two keys per lock.
f. Six linear ft of metal bookshelves.
g. Two swivel arm chairs.
h. Two straight chairs.
iI. One drafting table stool.
j. One tackboard 36 x 60 inch.
k. One waste basket per desk and table.

I. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00.

J. Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.

K. Installation:
1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
2. Parking: Two hard surfaced parking spaces for use by the Owner and Architect/Engineer, connected to office by hard surfaced walk.
3. Employee Residential Occupancy: Not allowed on Owner's property.

L. Maintenance and Cleaning:
1. Daily janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
2. Maintain approach walks free of mud, water, and snow.

M. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.12 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate as Work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Location as indicated. Approved by Owner.

E. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets.

H. Designated existing on-site roads shall not be used for construction traffic.

1.13 PARKING

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. Location as approved by Architect/Engineer.

C. When site space is not adequate, provide additional off-site parking.

D. Use of designated existing on-site streets and driveways used for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.

E. Use of designated areas of existing parking facilities used by construction personnel is not permitted.

F. Do not allow heavy vehicles or construction equipment in parking areas.

G. Do not allow vehicle parking on existing pavement.

H. Designate two parking spaces for the Owner and Architect/Engineer.

I. Permanent Pavements And Parking Facilities:
   1. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
   2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
   3. Use of permanent parking structures not permitted.

J. Maintenance:
   1. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
   2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

K. Removal, Repair:
   1. Remove temporary materials and construction when permanent paving is usable.
   2. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.
   3. Repair permanent facilities damaged by use, to specified condition.

L. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.15 PROJECT IDENTIFICATION

A. Project Identification Sign:
   1. One painted sign, 32 sq ft area, bottom 6 feet above ground.
   2. Content:
      A. Project title, logo and name of Owner as indicated on Contract Documents.
      B. Names and titles of authorities.
      C. Names and titles of Architect/Engineer and Consultants.
      D. Name of Prime Contractor and major Subcontractors.
      E. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.

B. Project Informational Signs:
   1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
   2. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
   3. Provide municipal traffic agency directional traffic signs to and within site.

4. No other signs are allowed without Owner permission except those required by law.

C. Design sign and structure to withstand 80-miles/hr wind velocity.

D. Sign Painter: Experienced as a professional sign painter for minimum three years.

E. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

F. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.

G. Sign Materials:
1. Structure and Framing: New, wood, structurally adequate.
2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum ¾ inch thick, standard large sizes to minimize joints.
3. Rough Hardware: Galvanized.
4. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
5. Lettering: Exterior quality paint, contrasting colors as elected.

H. Installation:
1. Install project identification sign within 15 days after date fixed by Notice to Proceed.
2. Erect at designated location.
3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
4. Install sign surface plumb and level, with butt joints. Anchor securely.
5. Paint exposed surfaces of sign, supports, and framing.

I. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

J. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore the area.

1.16 TRAFFIC REGULATION

A. Signs, Signals, And Devices:
1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by local jurisdictions.
2. Traffic Control Signals: As approved by local jurisdictions.
3. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
4. Flagperson Equipment: As required by local jurisdictions.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:
1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
2. Confine construction traffic to designated haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

E. Traffic Signs And Signals:
1. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
3. Relocate as Work progresses, to maintain effective traffic control.

F. Removal:
1. Remove equipment and devices when no longer required.
2. Repair damage caused by installation.
3. Remove post settings to a depth of 2 feet.

1.17 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.18 ENCLOSURES AND FENCING

A. Construction: Contractor's option.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. Exterior Enclosures:
   1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.19 SECURITY

A. Security Program:
   1. Protect Work from theft, vandalism, and unauthorized entry.
   2. Initiate program at project mobilization.
   3. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

B. Entry Control:
   1. Restrict entrance of persons and vehicles into Project site.
   2. Allow entrance only to authorized persons with proper identification.
   3. Maintain log of workers and visitors, make available to Owner on request.

C. Personnel Identification:
   1. Provide identification badge to each person authorized to enter premises.
   2. Badge To Include: Personal photograph, name, expiration date and employer.
   3. Maintain a list of accredited persons, submit copy to Owner on request.
   4. Require return of badges at expiration of their employment on the Work.

D. Restrictions:
   1. Do not allow cameras on site or photographs taken except by written approval of Owner.
   2. Do no work on days indicated in Owner-Contractor Agreement.

1.20 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.21 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.22 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize amount of bare soil exposed at one time.

C. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.23 PEST CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work.

1.24 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of local jurisdiction.

1.25 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.26 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 5723
TEMPORARY STORM WATER PREVENTION CONTROL

BMP - BEST MANAGEMENT PRACTICES
CSN -CONSTRUCTION SITE NOTICE- (NOI- CSN FOR LARGE SITES; CSN FOR SMALL SITES).
NOI & NOT - NOTICE OF INTENT AND NOTICE OF TERMINATION FOR TPDES PERMITS.
SWPPP - STORM WATER POLLUTION PREVENTION PLAN
TCEQ - TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
TPDES - TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM
LARGE CONSTRUCTION ACTIVITIES - CONSTRUCTION ACTIVITIES INCLUDING CLEARING, GRADING AND EXCAVATING THAT RESULT IN LAND DISTURBANCE OF EQUAL TO OR GREATER THAN FIVE (5) ACRES.
SMALL CONSTRUCTION ACTIVITIES - CONSTRUCTION ACTIVITIES INCLUDING CLEARING, GRADING AND EXCAVATING THAT RESULT IN LAND DISTURBANCE OF EQUAL TO OR GREATER THAN ONE (1) ACRE AND LESS THAN FIVE (5) ACRES OF LAND.

8.01 RELATED DOCUMENTS AND APPLICABLE WORK

A. The TCEQ TPDES General Permit No. TXR150000, March 5, 2008 and the project SWPPP. This specification requires compliance with all provisions of the TCEQ with regards to the TPDES permit. The TCEQ requirements currently pertain to large construction activities of five (5) acres or more and small construction activities which disturb one (1) to less than five (5) acres.
   1. Information to Respondents, Agreement, and Special Conditions shall be carefully read for provisions pertaining to this work. In the event of conflict, the better quality or greater quantity shall prevail.
   2. The work described in this section is applicable to any and all sections of the Contract Documents. Any and all work that would disturb the existing site conditions or present the potential for site run-off shall adhere fully to this specification section.
   3. Unless specifically notified to the contrary by the Owner, in writing, all aspects of this specification shall apply to this project.

B. CONTRACTOR RESPONSIBILITIES
   1. This project requires implementation of storm water “Best Management Practices” (BMP) for control devices and monitoring by the Contractor to comply with all provisions of the Storm Water Pollution Prevention Plan (SWPPP) developed for the project by the licensed civil engineer. The Contractor must fulfill all Texas Pollutant Discharge Elimination System (TPDES) regulatory requirements, including the filing of a NOI and NOT or signing and posting of the Construction Site Notice (CSN).
   2. The Contractor shall provide signatures of a corporate Officer for the NOI, NOI-CSN, CSN and NOT and any other forms or applications as required by the TPDES General Permit TXR150000. The Contractor shall also provide delegated authorization to sign reports per 30 TAC 305.128. Individuals conducting site inspections shall be qualified to the satisfaction of the Owner.
   3. When the Contractor receives the approved SWPPP from the Owner, the Contractor signs the NOI and/or CSN (see Sample form in Part 4 of this section) and forwards it to the Owner. Two separate $325 application fees (one for the Owner and one for the Contractor) must accompany the NOI. The Owner signs his NOI and sends both NOI’s and application fees to TCEQ. The Contractor shall insert a copy of the signed NOI or CSN into the SWPPP booklet to be kept at the jobsite. The $325 application fees are not required for Small Construction Sites or CSN sites.
   4. The SWPPP booklet kept at the jobsite shall also contain the following:
      a. 1.3.4.1 A letter delegating signature authority to the field personnel for both the
         1) Contractor and the Owner.
            (a) 1.3.4.2 A copy of TPDES permit when received.
            (b) 1.3.4.3 A copy of the Construction Site Notice (Large or Small).
            (c) 1.3.4.4 A copy of the Shared SWPPP Acceptance Certification form.
      b. The Contractor shall review SWPPP and verify existing conditions at the site before determining scope of implementation of site controls. Site survey and site plan drawings

shall be used for additional reference. The Contractor shall notify the Owner, in advance, of this site review to allow for Owner participation.

c. The Contractor shall construct a Project SWPPP sign and place it at the main entrance to the project site. This sign shall include the NOI and TPDES permit along with the TCEQ TPDES Large Construction Site Notice (NOI-CSN); or the Construction Site Notice (CSN) for small construction projects. The sign shall be constructed as detailed in the sample SWPPP sign drawing included in Part 4 of this Section.

d. Contractor shall contact Construction Inspector (CI) for review of initial site controls in place prior to commencing site-disturbing activities, to ensure that any unusual circumstances or unforeseen site conditions with regard to erosion and
   1) sedimentation have been addressed. The Contractor shall complete the SWPPP Project Start-up form (see Sample in Part 4 of this Section)) and review it with the Owner before commencing soil disturbing activities. Both parties shall sign this form when the requirements listed in the SWPPP Project Start-up form have been met.

e. The Contractor shall provide all material, labor, equipment and services required to implement, maintain and monitor all erosion and sedimentation controls in compliance with the Storm Water Pollution Prevention Plan (SWPPP). All controls implemented by the Contractor shall comply with the Texas Pollutant Discharge Elimination System (TPDES) regulations as issued by the Texas Commission on Environmental Quality (TCEQ) on March 5, 2008. These controls shall remain in operation until project completion and reestablishment of the site or longer as directed by the RCM. The work shall include, but not be limited to the following:
   1) 1.3.8.1 All earthwork as required to implement swales, dikes, basins and other excavations for temporary routing of utilities, to protect against erosion or sediment-laden (“polluted”) storm water runoff.
   2) 1.3.8.2 All structural controls as shown or specified, including silt fences, sediment traps, stabilized construction entrance, subsurface drains, pipe slope drains, inlet/outlet protection, reinforced soil retention, gabions, rock berms, etc
   3) 1.3.8.3 All non-structural controls as shown or specified, including temporary or permanent vegetation, mulching, geotextiles, sod stabilization, preservation of vegetative buffer strips, preservation/protection of existing trees and other mature vegetation.
   4) 1.3.8.4 All modifications and revisions to SWPPP necessary to meet changing site conditions and to address new sources of storm water discharges, as the work progresses.
   5) 1.3.8.5 All maintenance and repair of structural and non-structural controls in place shall continue until final stabilization is achieved or as directed by the RCM.
   6) 1.3.8.6 Weekly site inspections, as required by the SWPPP, of pollutant sources, including hazardous sources, structural and non-structural controls, and all monitoring of SWPPP revisions and maintenance of inspection records.
   7) 1.3.8.7 Removal of all structural and non-structural controls as necessary upon completion, and only after final stabilization is achieved.
   8) 1.3.8.8 Filing of Notice of Termination (NOT) with the RCM within 30 days of final stabilization being achieved and is approved by the Owner, or of another Operator assuming control of the unstabilized portions of the site.
   9) 1.3.8.9 Refer to the SWPPP for additional requirements to ensure compliance with
      (a) TPDES regulations.

5. QUALITY ASSURANCE
   a. In order to minimize the discharge of pollutants to storm water, the Contractor shall implement all permanent and temporary site controls according to Texas Pollutant Discharge Elimination System (TPDES) Guidelines, as set forth by the Texas Commission on Environmental Quality.
   b. Implementation of site controls shall be performed by a qualified contractor experienced in the proper installation of such devices in accordance with manufacturers’

specifications, and in keeping with recognized Best Management Practices (BMP's), and in keeping with TPDES regulations. Qualification of installing Contractor shall be reviewed with the Owner prior to entering into a contract with them for services.

c. The Contractor shall inspect all BMP's at regular intervals as specified in the Storm Water Pollution Prevention Plan for this project. Use standard Owner Inspection forms (see form at the end of this Section) for each inspection. Record all deficiencies of site controls, and take immediate action to correct any deficiencies recorded. Keep records of inspections current and on file, available for review by EPA, TCEQ, MS4 operator and Owner.

6. SUBMITTALS

a. Submittals of products used in structural and non-structural controls shall be made through established procedures for review and approved by the Owner prior to installation on the site. The Contractor shall make available physical samples and product literature on any material used in structural or non-structural controls during the course of the project prior to its implementation in the field.

PART 2 - PRODUCTS

MATERIALS

10.01 SPECIFIC SITE CONTROL DEVICES ARE IDENTIFIED IN THE SWPPP. WHERE SUCH DEVICES ARE INDICATED, THEIR MATERIAL COMPOSITION SHALL COMPLY WITH THIS SECTION.

A. Materials to be used in structural and non-structural site controls shall include, but not be limited to the following:

1. 2.1.1.1 Silt Fences: implemented to filter, and remove sediment from storm water shall be composed of the following materials:

a. Geotextile fabric - a non-woven, polypropylene, polyethylene, or polyamide fabric with non- raveling edges. It shall be non- biodegradable, inert to most soil chemicals, ultraviolet resistant, unaffected by moisture and other weather conditions, and permeable to

1) water while retaining sediment. Fabric shall be 36 inches wide, with a minimum weight of 4.5 oz/yd.

(a) Posts - steel fence posts shall be made of hot rolled steel, galvanized or painted, a minimum of 4 feet long, with a Y-bar or TEE cross- section of sufficient strength to withstand forces implied.

(1) Wire Backing - a galvanized, 2"x4", welded wire fencing, 12 gauge minimum.

Width shall be sufficient to support geotextile fabric 24 inches above adjacent grades. Chain link fences located along the same lines as silt fences, may be use to support geotextile fabric. In this circumstance, the geotextile fabric shall be firmly attached to fence.

(b) 2.1.1.2 Triangular filter dikes: for use on surfaces or in locations where standard silt fence cannot be implemented, shall be composed of the following:

(1) Geotextile fabric - a non-woven, polypropylene, polyethylene, or polyamide fabric with non raveling edges, in a minimum width of 60 inches.

(2) Dike Structure - 6 gauge, 6x6 welded wire mesh, 60 inches wide, folded into a triangular form. Each side shall be 18 inches with an overlap of 6 inches.

(3) Ties - metal shoat rings or standard wire/cable ties for attachment of wire mesh to itself, and for attachment of geotextile fabric to wire mesh.

(c) 2.1.1.3 Stabilized construction exit: A steel grid that allows the safe passage of vehicles while agitating the tires to loosen and remove the soil build up. The grid or structures shall conform to the following:

(1) It shall consist of pipes or tubes spaced such that there is a minimum clear distance between the pipes or tubes of 4 ½". It shall be elevated above the ground surface a minimum of 8" to allow water, debris and soil to drain.

(2) Minimum diameter of pipe or tube shall be 3".

(3) It shall be designed to support any and all vehicles entering and leaving the construction site.

(4) It shall be firmly placed in the ground at the exit.

(5) It shall be of sufficient length so that the agitation will remove the soil from the tires or a minimum of 8'-0".
(6) At the "street side" approach of the grid there shall be an impervious surface or it shall consist of 3" to 5" diameter angular crushed stone/rock approximately 5'-0" in length, minimum, and 8" deep, minimum. On the "job site" side of the grid, there shall be 3" to 5" diameter angular crushed stone/rock 15"-0" in length, minimum, 8" deep, minimum. The steel grid will be between the "street side" approach and the job site crushed stone/rock. All crushed stone/rock shall have filter fabric beneath the stone/rock. See diagram on Exhibit F.
(7) Steel grid area shall be used as the tire wash area. When tire wash is in use (rainy or muddy days) the area shall be manned and the tires shall be washed using a high pressure hose/nozzle.
(8) The area beneath the grid shall be sloped such that debris, soil and water shall be diverted back on to the construction site or to a sediment basin. No water, soil or debris shall leave the construction site. The resulting discharge shall be disposed of properly.

(d) 2.1.1.4 Rock Berms: shall be composed of the following materials:
(e) Rock - clean open graded rock, with a maximum diameter of 3 inches. b.Wire Mesh Support - a galvanized, woven wire sheathing having a maximum opening size of 1 (one) inch, and a minimum wire diameter
(1) of 20 gauge.
(2) Ties - metal shoat rings or standard wire/cable ties.
(f) 2.1.1.5 Concrete Truck Washout (self installed): shall be used for containment of fluids from concrete truck washout wastes.
(1) Gravel bags, concrete blocks or open graded rock b. 10 mil plastic sheeting
(g) 2.1.1.6 Temporary Storage Tanks: shall be used for temporary storage of fuels on the construction project site
(1) 2 inches of sand on the bottom of the containment area b. 6 mil plastic sheeting
(2) 2 inches of sand on top of the plastic sheeting
(h) 2.1.1.7 Erosion Control Matting: shall be used on steep slopes, in drainage swales, and in high traffic pedestrian areas of barren soil. It shall include one or more of the following:
(1) Jute Mat - a plain fabric made of jute yarn, woven in a loose and simple manner, with a minimum unit weight of 2.7 pounds per square yard. Width shall be as required for the dimensions of the area to be covered.
(2) Wood Fiber Mat - a mat composed of wood fibers, which are encased in nylon, cotton or other type of netting.
(3) Synthetic Webbing Mat - a mat manufactured from polyvinyl chloride or polypropylene monofilament, which are bonded together into a three-dimensional web to facilitate erosion control and/or re- vegetation.
(i) 2.1.1.8 Organic mulches: shall be used for covering bare soil, retaining moisture under existing vegetation being preserved, and for absorbing the energy of compaction caused by foot or vehicular traffic. Mulch shall be one or more of the following:
(1) Straw - from broken straw bales that are free of weed and grass seed where the grass from the seed is not desired vegetation for the area to be protected.
(2) Wood Chips - from chipped limbs of cleared trees on site, or delivered in chipped form, in bulk quantities of pine, cedar or cypress. Wood chips of all species shall be partially decomposed to alleviate nitrogen depletion of the soil in areas where existing vegetation is to be preserved and protected.

(3) Shredded Mulches - from pine, cypress or cedar, mechanically shredded, and capable of forming an interlocking mat following placement, and after sufficient wetting and drying has taken place naturally.

(j) 2.1.1.9 Any other materials indicated in SWPPP.

PART 3 - EXECUTION

GENERAL

12.01 THE CONTRACTOR SHALL PROVIDE A COMPLETE INSTALLATION OF ALL SITE CONTROL DEVICES AND MEASURES (BMPS). INDICATED IN THE SWPPP BOOKLET, INCLUDING THE SITE EROSION AND SEDIMENTATION CONTROL DRAWING AND AS SPECIFIED HEREIN. THESE BMPS MUST BE CONFIRMED AS FULLY OPERATIONAL WITH THE OWNER BEFORE ANY WORK THAT DISTURBS THE SITE CAN BEGIN.

12.02 THE CONTRACTOR SHALL PROVIDE INSPECTION AND MONITORING OF CONTROLS IN PLACE AND SHALL PERFORM ALL REVISIONS AND UPDATING OF SWPPP BOOKLET. AN ACCURATE, CHRONOLOGICAL RECORD OF ALL CONTRACTOR INSPECTIONS REVISIONS AND ADDITIONAL CONTROLS SHALL BE KEPT ON FILE AT THE PROJECT SITE, FOR REVIEW, WITH A COPY OF THE SWPPP BOOKLET.

12.03 THE CONTRACTOR SHALL SUBMIT THEIR NOTICE OF TERMINATION (NOT) TO THE OWNER AFTER ALL DISTURBED AREAS ARE RE-ESTABLISHED (STABILIZED) WITH VEGETATIVE COVER FOLLOWING COMPLETION OF CONSTRUCTION. FOLLOWING ACCEPTANCE OF STABILIZED AREAS, ALL SITE CONTROLS THAT ARE NO LONGER NECESSARY SHALL BE REMOVED.

A. CONTROL DEVICES

B. Execution of specific site control devices is described in the following paragraphs. Refer to the SWPPP for applicable devices, extent and location.

1. SILT FENCE

a. 3.2.1.1 Silt fences shall consist of non-woven geotextile fabric, attached to wire fabric backing to support the geotextile. The wire fabric should be galvanized 2" x

1) 4" welded wire, 12-gauge minimum. Attach non-woven geotextile fabric to fence with shoat or standard cable/wire ties, leaving a "toe" of fabric at the

2) bottom of the fence of not less than 6 (six) inches. Steel posts as specified shall be driven to a depth of 1 (one) foot minimum, and spaced not more than

3) 6 (six) feet on center. Tilt posts slightly, in an "uphill" direction for additional strength. Attach fencing to posts with standard cable/wire ties. Dig a 6 (six) inch deep by 6 (six) inch wide trench on the disturbed side of the fence, bury geotextile fabric in trench, backfill and tamp. Abutting ends of geotextile fabric shall be overlapped a minimum of 12 (twelve) inches.

(a) 3.2.1.2 Maintain silt fence daily as necessary to repair breaches in geotextile fabric.

(1) Maintain steel posts as specified in tilted condition. When siltation has occurred, it shall be removed when it has reached a depth of 6 (six) inches. Silt that has been removed shall be disposed of off site.

(b) 3.2.1.3 Remove silt fence when the disturbed areas protected by silt fence have been completely stabilized as specified. Minimize site disturbance while removing silt fence and posts.

b. CURB INLET PROTECTION

1) 3.2.2.1 Cover curb storm inlet with non-woven geotextile fabric covered wire fabric.

(a) Wire fabric to be 2"X4" - W1.4XW1.4. Extend fabric 2(two) feet beyond inlet opening at each end and 12" (twelve) in front of opening in the gutter. Remove strip of filter fabric apx. 2 1/2" (two and one half) high for the length of the protection to act as overflow. Extend fabric over the top of opening to allow placement of gravel bags. Anchor fabric with 20 lb. gravel bags placed 3 (three) feet on center.

(b) 3.2.2.2 Maintain inlet protection daily as necessary to repair breaches in geotextile fabric. When siltation has occurred, it shall be removed when it has reached a depth of 2 (two) inches. Silt that has been removed shall be disposed of off site.

c. STABILIZED CONSTRUCTION EXIT

1) 3.2.3.1 A steel grid that allows the safe passage of vehicles while agitating the tires to loosen and remove the soil build up. The grid or structures shall conform to the following:
   (a) It shall consist of pipes or tubes spaced such that there is a minimum clear distance between the pipes or tubes of 4 ½". It shall be elevated above the ground surface a minimum of 8" to allow water, debris and soil to drain.
   (b) Minimum diameter of pipe or tube shall be 3".
   (c) It shall be designed to support any and all vehicles entering and leaving the construction site.
   (d) It shall be firmly placed in the ground at the exit.
   (e) It shall be of sufficient length so that the agitation will remove the soil from the tires or a minimum of 8'-0".
   (f) At the "street side" approach of the grid there shall be an impervious surface or it shall consist of 3" to 5" diameter angular crushed stone/rock approximately 5'-0" in length, minimum, and 8" deep, minimum. On the "job site" side of the grid, there shall be 3" to 5" diameter angular crushed stone/rock 15"-0" in length, minimum, 8" deep, minimum. The steel grid will be between the "street side" approach and the job site crushed stone/rock. All crushed stone/rock shall have filter fabric beneath the stone/rock. See diagram on Exhibit F.
   (g) Steel grid area shall be used as the tire wash area. When tire wash is in use (rainy or muddy days) the area shall be manned and the tires shall be washed using a high pressure hose/nozzle.
   (h) The area beneath the grid shall be sloped such that debris, soil and water shall be diverted back on to the construction site or to a sediment basin. No water, soil or debris shall leave the construction site. The resulting discharge shall be disposed of properly.

d. ROCK BERM
   1) 3.2.4.1 Rock berm shall consist of rip-rap type rock, secured within a wire sheathing as specified, and installed at the toe of slopes, or at the perimeter of developing or disturbed areas. Height of berm shall be a minimum of 18 (eighteen) inches from top of berm to uphill toe of berm. Top width shall be a minimum of 24 (twenty four) inches, with side slopes of 2:1 or flatter. Uphill toe of berm shall be buried a minimum of 4 (four) inches into existing grade. Rock berm shall have a minimum flow-through rate of 60 (sixty) gallons per minute, per square foot of berm face.
   2) 3.2.4.2 Maintain rock berm in a condition that allows the sediment to be removed, when the depth of sediment has reached 1/3 (one third) the height of the berm.

   Berm shall be reshaped as needed, and silt buildup removed, to maintain specified flow through berm.

   3) 3.2.4.3 Rock berm shall be removed when the disturbed areas served have been stabilized as specified.

e. CONCRETE TRUCK WASHOUT (SELF INSTALLED)
   1) 3.2.5.1 Concrete Truck Washout (self installed) shall be constructed so that it will be able to accommodate the maximum number of anticipated concrete trucks that will be cleaned on any given day at any given time using 7 gallons of water being used for washout per truck or 50 gallons of water being used to wash out pump trucks.

   The area utilized to contain the wash water and concrete solids cleaned from the trucks will be a minimum of 10 feet in width. The containment area will be covered with 10 mil plastic sheeting without any holes or tears and the seams shall be sealed according to manufacturer's recommendations. The gravel bags, concrete blocks or open graded rocks shall line the outside perimeter and shall be double wrapped
   (a) with the 10 mil plastic sheeting to prevent any potential for runoff from the containment area.

(b) 3.2.5.2 The concrete truck washout containment area shall be maintained in a condition that will not allow concrete build up within the containment area to exceed 50% of the storage capacity.
(c) 3.2.5.3 The concrete truck washout area will be removed when it is no longer necessary to wash out concrete trucks on the site.

f. TEMPORARY STORAGE TANKS
1) 3.2.6.1 Must be located in a bermed containment area. The berm must be a minimum 3 feet in all directions, and the height of the berm must contain the maximum contents of the largest tank plus 8 inches (approximately 110% of the tank capacity). The containment area is constructed by beginning with a
(a) 2 inch sand pad, and then covered with 6 mil plastic or rubber sheeting. The sheeting is then covered with another 2 inch layer of sand. The plastic sheeting is secured to the outer berm.
(b) 3.2.6.2 Storage tanks are to be placed no closer than 50 feet from a building or property line.
(c) 3.2.6.3 If using tanks with a gravity feed type set up, the containment must be of sufficient size to be able to contain the tank if it should fall over
(d) 3.2.6.4 There must be a fusible link at the valve that will shut off the flow to the hose in the event of a fire
(e) 3.2.6.5 There must be sufficient cover for the tank and the containment area to prevent potential stormwater runoff
(f) 3.2.6.6 The area within the containment area is to be kept free and clear of spills, if a spill occurs then the sand is to be removed and replace with a fresh layer of sand.
(g) 3.2.6.7 The storage tank containment area is to be removed from the site once it has been determined that it will no longer be used on the construction site.

g. DIVERSION DIKE
1) 3.2.7.1 Diversion dikes shall be formed and shaped using compacted fill, and shall not intercept runoff from more than 10 (ten) acres. Dike shall have a minimum top width of 24 (twenty four) inches, and a minimum height of 18 (eighteen) inches. Soil shall have side slopes of 3:1 or flatter, and shall be placed in 8 (eight) inch lifts. Compact soil to 95% standard proctor density. Where protected slopes exceed 2 (two) percent, the uphill side of diversion dike shall be stabilized with crushed stone or erosion control matting - to a
(a) distance of not less than 7 (seven) feet from toe of dike. The channel, which is formed by the diversion dike, must have positive drainage for its entire length to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure.
Storm water shall not be allowed to overflow the top of diversion dike at any point other than the stabilized outlet.
(b) 3.2.7.2 Maintain diversion dike in a condition that allows the storm water runoff to be diverted away from exposed slopes. Repair any failures at top of dike and remove sediment as necessary behind dike to allow positive drainage to a stabilized outlet.
(c) 3.2.7.3 Remove diversion dike when the expose slopes being protected are stabilized with vegetation or other permanent cover.

h. INTERCEPTOR SWALE
1) 3.2.8.1 Interceptor swale shall be implemented to prevent on or off-site storm water from entering a disturbed area, or prevent sediment-laden runoff from leaving the site or disturbed area. Interceptor swale shall be excavated as required by the SWPPP drawing/s, with side slopes of 3:1 or flatter. This shall include all labor and equipment associated with the installation and maintenance of the swale as shown on the construction documents. Constructed swale may be v-shaped or trapezoidal with a flat bottom, depending on the volume of water being channeled. Sediment laden runoff from swale shall be directed to a stabilized outlet or sediment-trapping device.

Flow line of swale shall have a continuous fall for its entire length and shall not be allowed to overflow at any other point/s along its length.

2) 3.2.8.2 Maintain interceptor swale in a condition that allows the storm water runoff to be channeled away from disturbed areas. Remove sediment in swale as necessary to maintain positive drainage to a stabilized outlet.

3) 3.2.8.3 Fill in or remove swale after the disturbed area/s being protected is completely stabilized as specified.

i. EROSION CONTROL MATTING

1) 3.2.9.1 Remove all rocks, debris, dirt clods, roots, and any other obstructions, which would prevent the matting from lying in direct contact with the soil. 6 inch by 6 inch anchor trenches shall be dug along the entire perimeter of the installation. Bury matting in trenches, backfill and compact. Fasten matting to the soil using 10 gauge wire staples, 6 inches in length and 1 inch wide. Use a minimum of one staple per 4 square feet of matting, and at 12 inches on center along all edges. Install parallel to flow of water and overlap joining strips a minimum of 12 inches.

2) 3.2.9.2 Maintain erosion control matting by repairing any bare spots. Missing or loosened matting shall be promptly replaced or re-anchored.

3) 3.2.9.3 Remove matting where protection is no longer required. In areas where permanent vegetation is established along with matting, matting can be left in place permanently.

j. 3.2.10 MULCHES

1) 3.2.10.1 Apply specified mulches in areas identified on the SWPPP, to a depth of 3 inches or as otherwise specified on the SWPPP drawing/s.

k. 3.2.11 BPM Details

l. 3.2.11.1 Refer to Exhibit's for the following BMP details:

1) 3.2.11.1.1 Exhibit "A" Area Inlet Detail
2) 3.2.11.1.2 Exhibit "B" Curb Inlet Detail
3) 3.2.11.1.3 Exhibit "C" Rock Berm Detail
4) 3.2.11.1.4 Exhibit "D" Silt Fence Detail
5) 3.2.11.1.5 Exhibit "E" Triangular Dike Detail
6) 3.2.11.1.6 Exhibit "F" Stabilized Construction Exit
7) 3.2.11.1.7 Exhibit "G" Concrete Truck Washout

C. INSPECTIONS AND RECORD KEEPING

1. Contractor shall inspect all BMP's on 7-day intervals. Coordinate inspections with CI, who is also required by TPDES to regularly inspect the site. Use standard Owner Inspection forms (see form in Part 4 of this Section) for each inspection. Record all deficiencies of site controls, and take appropriate action to correct any deficiencies recorded. Exception is rock berms located in a streambed. Any rock berm located in a streambed shall be inspected on a daily basis. Keep records of inspections current and on file, available for review by EPA, TCEQ, MS4 operator Representative and/or Owner's Representative/s.
2. Contractor shall keep records of all Contractor inspections on file with SWPPP booklet at project site, and make available for review by Owner's Representative/s or EPA, TCEQ or MS4 operator officials requesting review of SWPPP inspection records. One copy of each inspection report shall be delivered to the CI and the RCM's office.
3. Contractor shall keep records of all major grading and stabilization activities on file with the SWPPP booklet at the project site and make available for review by owner's representative(s), EPA, TCEQ, or MS4 operator officials requesting review of the SWPPP.
4. Contractor shall submit copies of all inspection records and the Major Grading and Stabilization Log and the Major Grading and Stabilization Log along with SWPPP booklet to the RCM at project completion.

D. MAINTENANCE

1. All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If through inspections the permittee

determines that BMP's are not operating effectively, maintenance must be performed before the next anticipated storm event or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Erosion and sediment controls that have been intentionally disabled, run-over, removed or otherwise rendered ineffective must be replaced or corrected immediately upon discovery.

E. PART 4 - SAMPLE FORMS
   1. The following forms or sketches are to be used by the Contractor in the execution of the work in this Section, in compliance with TPDES requirements and the SWPPP.
   2. Coordinate with the City of Pharr for any required SWPPP permit forms.
   3. Major Grading and Stabilization Log
   4. SWPPP Posting Sign for Main Construction Entrance for large construction site 5 acres or greater
   5. SWPPP Posting Sign for Main Construction Entrance for small construction site 1 to less than 5 acres
   6. Contact the Owner's representative for useable copies of these forms to be used in the execution of work in this section.
   7. TCEQ TPDES Notice of Intent (TCEQ NOI)
   8. TCEQ TPDES Construction Site Notice (CSN)
   9. TCEQ TPDES Notice of Termination (TCEQ NOT)
   10. TCEQ TPDES Large Construction Site Notice (NOI-CSN)
   11. Shared SWPPP Acceptance Certification form

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. THE OWNER requires that this project generate the least amount of trash and waste possible.
B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
E. Methods of trash/waste disposal that are not acceptable are:
    1. Burning on the project site.
    2. Burying on the project site.
    3. Dumping or burying on other property, public or private.
    4. Other illegal dumping or burying.
F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
I. Return: To give back reusable items or unused products to vendors for credit.
J. Reuse: To reuse a construction waste material in some manner on the project site.
K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
    1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to THE OWNER.
3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, THE OWNER, and Engineer.
C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.
E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

1.2 PRODUCTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the Substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension, which may subsequently become apparent.
5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.

2. Field engineering and surveying.

3. Installation of the Work.

4. Cutting and patching.

5. Coordination of Owner-installed products.

6. Progress cleaning.

7. Starting and adjusting.

8. Protection of installed construction.

9. Correction of the Work.

B. Related Requirements:

1. Section 01 33 23 "Shop Drawings and Samples". Revise first subparagraph below to suit Project.

2. Section 01 70 00 "Project Closeout" Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor professional engineer.

B. Certificates: Submit certificate signed by land surveyor professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Final Property Survey: Submit 6 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following; but not limited to:

a. Primary operational systems and equipment.

b. Fire separation assemblies.

c. Air or smoke barriers.

d. Fire-suppression systems.

e. Mechanical systems piping and ducts.

f. Control systems.

g. Communication systems.

h. Fire-detection and -alarm systems.

i. Conveying systems.

j. Electrical wiring systems.

k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or those results in

   increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

   a. Water, moisture, or vapor barriers.

   b. Membranes and flashings.

   c. Exterior curtain-wall construction.

   d. Sprayed fire-resistive material.

   e. Equipment supports.

   f. Piping, ductwork, vessels, and equipment.

   g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.

2. List of detrimental conditions, including substrates.

3. List of unacceptable installation tolerances.

4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. General: Engage a land surveyor professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

4. Inform installers of lines and levels to which they must comply.

5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.

7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect and Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Pre-installation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 0 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 81 19
INDOOR AIR QUALITY REQUIREMENTS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, transportation, protection, and services necessary for, and incidental to, the proper execution and completion of all Indoor Air Quality Requirements, as specified herein. Work includes, but is not necessarily limited to the following:

1. Construction procedures to promote adequate indoor air quality after construction.

2. Building flush-out after construction and before occupancy.

3. Testing indoor air quality after completion of construction.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Testing and Inspecting Services - Section 01 45 23.

2. Temporary Facilities and Controls - Section 01 50 00.

3. HVAC Filters - Section 24 40 00.

4. Testing, adjusting, and balancing for HVAC - Section 23 05 93.

1.02 PROJECT GOALS

A. Maintain a healthy environment for the present and future occupants of the building. Therefore, the Contractor shall conduct the work in such a way as to avoid creating indoor air quality problems.
Required procedures:

1. Limiting use of products that may contribute to poor indoor air quality.

2. Maintaining work procedures which contain and alleviate dusts and odors and air-borne contaminants.

3. Protection of materials from moisture.

B. The Contractor's attention is directed to provisions throughout the Contract Documents intended to maintain indoor air quality during construction and after completion of the Project. These provisions will be strictly enforced. The Contractor shall notify and require each subcontractor, sub-subcontractor and materials vendors to comply with such provisions.

1.03 DEFINITIONS

A. Definitions Pertaining to Sustainable Development: As defined in ASTM E2114.

B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabric, fibrous insulation, and other similar products.

D. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

E. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

F. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

G. Interior final finishes: Materials and products that will be exposed at interior occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.

H. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

I. Particulates: Dust, dirt, and other airborne solid matter.

J. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

K. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.04 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE): ASHRAE Standard 62 -2007, Ventilation for acceptable Indoor Air Quality.

B. American National Standards Institute (ANSI)/ASHRAE Standard 52.2 -1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

C. Sheet Metal and Air Conditioning National Association (SMACNA): “IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007” and Duct Cleanliness for New Construction Guideline.” D. U.S. Environmental Protection Agency Compendium of Method for Determination of Air Pollutants in Indoor Air.

1.05 PERFORMANCE REQUIREMENTS

A. VOC Emissions: Products have been selected for this Project with respect to their emissions of Volatile Organic Compounds, in order to limit concentrations of VOC’s in occupied spaces.

1. Substitution for any specified VOC-containing product specified will be considered with the condition that acceptable VOC-emission data are available for the proposed product, or the Contractor arranges to have that product tested for VOC emissions by an independent laboratory.

B. Airborne Dust: Dust Partitions, site dust control measures and other construction practices shall be maintained to prevent airborne dust from leaving the site or accumulating in the building interior.

C. Moisture: Weather protection, scheduling of the work, restoration drying techniques using desiccants drying, dehumidification and other construction practices shall be used to maintain the schedule and to prevent construction materials from reaching moisture levels that will support the growth of mold, bacteria and other biological contaminants.

1. Maximum Equivalent Moisture Content (EMC) of substrates installed wet or wetting during the construction process such as concrete, and concrete block shall be measured before application of mold-sensitive finishes. Installation of the following products shall not proceed until the relative humidity in the substrate does not exceed 70 percent relative Humidity (RH) as measured using ASTM F 2170, or in accordance with the manufactures ‘s written limitations, whichever is lower:

    a. Non-preservative-treated wood products.

    b. Gypsum Wallboard.

    c. Carpet.

    d. Acoustical Ceiling Tile.

    e. Fabric-covered acoustical panels and tack boards.

    f. Fixed upholstered seating.

2. Wood-based finish products such as flooring, architectural woodwork, casework, etc. shall additionally follow the environmental temperature and RH criteria limits established within the respective sections.

1.06 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Temporary HVAC Filters: Provide product data for during construction, at flush-out and installed at Substantial Completion, Highlighting MERV and other performance data.

C. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IAQ Management Plan; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide including, but not limited to, the following:

1. Indentify potential sources of odor and dust.

2. Identify construction activities likely to produce odor and dust.

3. Identify porous materials and absorptive materials.

4. Identify areas of project potentially affected, especially occupied areas.

5. Evaluate potential problems by severity and describe methods of control.

6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and scheduled for replacement of filters.

7. Describe cleaning and dust control procedures.

8. Describe storage and moisture protection control procedure.

9. Describe the building flush-out procedures including the dates when flush-out will begin and completed.

10. Describe coordination with commissioning procedures.

11. Describe the air contaminant test procedures including the following:

    a. Identify the Testing Agency qualifications.

    b. Identify the locations and scheduling of the air sampling.

    c. Describe Test procedures in detail.

    d. Indentify the Test instruments and apparatus.

    e. Describe the sampling method.

D. Interior Finishes Installation Schedule: Indentify each interior finish that either generates odors, moisture, or vapors or is susceptible to absorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

E. Construction Documentation: Size photographs at three different occasions during construction along with brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive material.

F. Duct and Terminal Unit Inspection Report.

G. Air Contaminant Test Reports: Provide the follow information in the Air Contaminant Test Report, but is not limited to, the following:

1. Location where each sample was taken and time.

2. Test values for each air sample; average the values of each set of 3.

3. HVAC operating conditions.

4. Certification of test equipment calibration.

5. Other conditions or discrepancies that might have influenced the results.

H. Moisture Testing: Evidence of testing of each substrate to receive mold-sensitive finishes in accordance with ASTM F 2170.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

E. Maintain at the contraction site a complete and up-to-date binder of MSDS for all products on-site containing VOC's. Upon the request of the Owner, make the binder available for review.

PART 2 - PRODUCT

2.01 MATERIALS

A. Through the Work, use products, materials which contribute the minimum practicable dust, odors and contaminants to indoor environment.

B. Products containing Volatile Organic Compounds (VOC's):

1. Comply with the following criteria for VOC Limits for the following field-applied products.

2. No urea formaldehyde containing products will be permitted for use in this project.

C. Indoor Chemical and Pollutant Source Control:

1. Provide temporary walk-off mats to reduce entry of dust, moisture and other contaminants into the building during construction.

2. Refer to Section 12 48 13 - Entrance Floor Mats and Frames, for permanent floor grilles to be installed at building entrances. These floor grilles shall be protected from dust, moisture and other contaminants until Substantial Completion.

D. Mechanical Systems and Controls: Refer to specification sections in Divisions 21, 22, 23 and 26 for mechanical and electrical provisions for maintaining Indoor Air Quality.

PART 3 - EXECUTION

3.01 GENERAL PROCEDURES FOR PROTECTING INDOOR AIR QUALITY

A. General: Provide physical barriers, ventilation and other controls as specified to reduce potential for odors, dust, and fumes from affecting present and future occupants of the building, and to meet performance criteria specified herein.

B. Material Transport and Storage:

1. Store construction materials, including ductwork, in clean, dry areas protected from moisture and dust. Refer to individual specification sections for additional on-site storage requirements for individual materials and equipment.

2. No Storage of construction material or debris will be permitted within mechanical rooms.

3. Adsorptive materials shall be protected throughout storage at the site in their original wrapping material.

4. Keep waste materials that can release dust or odors covered and sealed when on site, and dispose of them promptly.

C. Installation Sequence: Schedule material installation and construction activities so as to avoid adsorption of VOC's and dust into adsorptive materials.

1. Provide protective cover for adsorptive materials that will be subjected to VOC off-gassing and dust.

a. Wrap adsorptive materials in polyethylene or other impermeable material and seal edges with tape.

b. Refer to SMACNA Guidelines for minimum requirements.

c. Protective cover is required for uninstalled materials stored in the construction area, as well as for installed materials.

2. Containers of VOC containing fluids shall be kept tightly sealed. When not in use, such containers shall be stored in a location remote from adsorptive materials or occupied areas.

3. Apply wet materials such as paints, coatings and products installed with adhesives, allowing them time to off gas before applying adsorptive or "sink" type products such as.

a. Acoustical ceiling tiles.

b. Carpet.

c. Fabric materials, upholstered products or fabric-wrapped panels for use as tack boards or acoustical purposes.

4. Permit carpeting to off gas for 48 hours at the plant prior to wrapping in plastic wrappings. Otherwise, before installation, open up carpet rolls and spread carpet out in an offsite location and ventilate in an area protected from weather, sources of moisture or other VOC's.

D. Regular Cleaning during Construction: The intent of these documents is to prevent accumulation of contaminant containing dirt and dust within the building during construction.

1. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces. Clean interior spaces prior to the start of finish painting and continue cleaning on as needed basis until painting is finished.

2. Use cleaning methods that minimize airborne dust. Recommended methods include:

a. Immediate removal of spills, excess applications of cleaning products and accumulated water.
b. Increased frequency of cleaning during construction, to maintain surfaces free of dust accumulation.
c. Use of wetting agents and sweeping compounds, and of efficient dust collection equipment such as damp mops and HEPA filtered vacuum cleaners.
d. Refer to SMACNA Guidelines for additional cleaning recommendations.

E. Protection of HVAC:

1. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

2. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

3. HVAC equipment and ductwork man NOT be used for ventilation during construction:

a. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.

b. Exhaust directly to outside.

c. Seal HVAC air inlets and outlets immediately after duct installation.

4. HVAC equipment and supply air ductwork may be used for ventilation during construction:

a. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.

b. Ensure that air filters are correctly installed prior to staring use; replace filters when they lose efficiency.

c. Do not use return air ductwork for ventilation.

d. Do not use return air ductwork for ventilation unless absolutely necessary.

e. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air; provide alternate return air pathways.

f. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

5. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

a. Inspect duct intakes, return air grilles, and terminal units for dust.

b. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduits.

c. Clean tops of doors and frames.

d. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduits, equipment, and supports.

e. Clean return plenums of air handling units.

f. Remove intake filters last, after cleaning is complete.

6. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

3.02 MIXING OF MULTI-COMPONENT PRODUCTS

A. General: Fluid-applied products furnished in two or more components shall be mixed thoroughly, in precise proportions so that an excess of one component will not remain uncured. The requirements of this section apply to all fluid-applied multi-component products, including but not limited to the following:

1. Multi-component adhesives.

2. Multi-component waterproofing and sealant products.

3. Multi-component paints and coatings

4. Multi-component fluid-applied floorings

B. Requirements:

1. All multi-component mixtures shall be brought to the Project Site in factory-sealed and premeasured containers with precise quantities required for proportional mixing. No bulk materials will be permitted on-site if not packaged in this manner.

2. Mix components in strict accordance with manufacturer's written instructions regarding quantities, mixing method and other conditions.

3. Each container of each component shall be completely mixed with the entire contents of a corresponding container of the second component.

a. No field mixing of partial quantities will be permitted.

b. Properly dispose of mixed components remaining unused at the end of a workday.

3.03 CONTROL OF COMBUSTION PRODUCTS

A. General: Minimize the use of fuel-burning equipment inside and near the building. Where fuel burning engines are necessary, cycle off equipment when not in use.

B. Vehicle Exhaust: No vehicles shall be left idling near temporary or permanent air intakes. Motorized vehicles used within the building shall be electrically powered.

C. Power Equipment: No internal combustion engines shall be operated within the building. Location of engines outside the building shall be remote from permanent air intakes and operable windows of occupied spaces.

D. Exhaust of Temporary Heating Equipment:

1. No temporary heating equipment that burns kerosene or other liquid fuel will be permitted within the building.

2. Temporary equipment that produces heat by combustion of fuel shall be installed with provisions to ventilate combustion gases to the exterior of the building.

E. Welding: Welding operations shall be properly ventilated.

F. Smoking: No smoking will be permitted within the construction site or adjacent areas at any time.

3.04 DUST CONTROL

A. General: The following provisions do not supersede specific requirements for methods of construction or applicable general conditions set forth elsewhere in the Contract with regard to performance obligations of the Contractor.

1. Maintain the construction site, stockpiles, access, detour, and haul roads, staging and parking area used for the Work, free of dust that would cause a hazard or a nuisance to those at the site or adjacent sites. Refer to Section 31 00 00 - EARTHWORK, for additional provisions for control of dust on the site.

2. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and use damp cloths and wetting agents or sweeping compounds to prevent air-borne dust from dispersing into the atmosphere.

3. Cutting of concrete and masonry products shall be performed using wet saw methods.

4. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

5. Clean interior spaces prior to the start of finish painting and continue cleaning on an as needed basis until painting is finished.

6. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces, including paint, coatings, sealants, caulking, adhesives.

B. Dust Partitions and Coverings:

1. Furnish, erect, and maintain for the duration of the work period, temporary fire-resistant dustproof coverings and solid partitions as required to prevent the spread of dust beyond the immediate area where work is being performed.

2. Temporary partitions for dust control shall extend from floor to bottom of structure above, to provide an air-tight barrier. Provide air-tight coverings for openings required for access through partitions.

3. Cover equipment installed within construction area using canvas, polyethylene and tape, or other materials as recommended by manufacturer of equipment for protection from airborne dust and vapors.

4. Refer to Section 01 50 00 – Temporary Facilities and Controls, for additional requirements for temporary partitions and related protective measures.

C. Prevent dust and odors from entering the new HVAC system. Confirm that the HVAC Subcontractor has sealed all diffusers, return side ductwork and equipment within the Work Area so as to prevent dust from entering. For further requirements, refer to SMACNA Guidelines and DIVISION 23 – Heating, Ventilating and Air Conditioning.

D. Prevent exterior dust and odors from entering interior space after building is enclosed. Whenever possible, seal window units with plastic as recommended in SMACNA Guidelines.

3.05 WATER DAMAGE

A. General: The General Contractor shall be responsible for protecting the Work from moisture, in order to prevent growth of harmful fungus, mold and other biological activity.

B. Protection of Existing and New Building Construction:

1. Refer to Section 01 50 00 - Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.

2. Remove and replace construction which becomes wet, or which shows evidence of biological growth due to the presence of moisture.

C. Protection of Stored Construction Materials:

1. Take precautions to prevent porous materials such as gypsum board, insulation, ceiling tile, wood and similar products from becoming wet.

2. Refer to Section 01 50 00 - Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.

3. Store materials above ground surfaces and provide spacers between ground and protective covering to allow for ventilation.

4. Discard construction material which becomes wet, or which shows evidence of biological growth due to the presence of moisture.

D. Procedures for drying out wet construction: In the case that an unanticipated event permits the entry of water into new or existing construction, the Contractor shall perform procedures to dry out construction within 24 hours, to a degree that will not support biological growth using restoration drying techniques.

1. Refer to guidelines published by the United States Environmental Protection Agency.

2. Construction that is not adequately dried out, or which shows evidence of biological growth, shall be removed immediately from the construction area and disposed of legally.

3. Wetting by contaminated water and subsequent cleaning and decontamination shall be supervised by a qualified company.

3.06 CLEAN UP

A. Prior to turning over work area to Owner, conduct final cleaning to remove dust to the minimum practicable level.

B. Clean ductwork, registers and grilles within the Work Area, and HVAC equipment servicing the Work Area using professional duct cleaning company.

C. After completion of duct cleaning, vacuum vertical and horizontal surfaces, ledges, trim, tops of light fixtures and other equipment, and other locations where dust has settled. Utilize HEPA filtered vacuum to capture fine dust.

D. Vacuum carpet tiles and fabric-covered surfaces with a high-efficiency particulate arrestor (HEPA) vacuum prior to Substantial Completion.

E. Do not use solvent-based cleaners in final cleaning of Work Area, unless cleaning occurs at least 14 days prior to Owner’s scheduled Active Use of the area.

F. Coils, air filters and fans in HVAC system shall be cleaned prior to final testing and balancing. Refer to Division 23 - HVAC, for requirements.

3.07 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:

1. All construction is complete.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.

4. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.

5. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.

1. Obtain concurrence that construction is complete enough before beginning flush-out.

2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.

3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.

4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 3,500 cubic feet per square foot of floor area prior to occupancy, and:

a. Begin ventilation at least three hours prior to daily occupancy.

b. Continue ventilation during all occupied periods until total air volume of 14,000 cubic feet per square foot of floor area has been achieved.

c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.08 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of postconstruction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:

1. All construction is complete, including interior finishes.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.

4. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.

2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet take samples from areas having the least ventilation and those having the greatest presumed source strength.

3. Collect samples from height from 36 inches to 72 inches above floor.

4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.

5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.

6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.

3. Formaldehyde: Not more than 27 parts per billion.

4. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.

5. 4-Phenylcyclohexene (4-PCH): Not more than 6.5 micrograms per cubic meter.

6. Particulates (PM10): Not more than 50 micrograms per cubic meter.

7. Regulated Pollutants: Measure in relation to outside air; not more than contained in outside air.

I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

END OF SECTION

SECTION 0 22 00
EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for slabs-on-grade.
   4. Subbase course for concrete walks.
   5. Excavating and backfilling trenches within building lines.
   6. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:
   1. Division 1 Section "Construction Facilities and Temporary Controls."
   2. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
   3. Division 2 Section "Excavation Support and Protection."
   4. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations.
   1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Each type of plastic warning tape.
   2. Drainage fabric.

B. Samples: For the following:
   1. 10-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

C. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups SC, GC, CL, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, GM, SC, SM, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Sub-base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
2. Tear Strength: 40 lbf; ASTM D 4533.
3. Puncture Resistance: 50 lbf; ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
5. Apparent Opening Size: No. 50; ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS

A. Excavate surfaces under walks to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 APPROVAL OF SUBGRADE

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Inspecting and testing underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.
   1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
D. Coordinate backfilling with utilities testing.
E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
F. Place and compact final backfill of satisfactory soil material to final subgrade.
G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
C. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
D. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

E. Retain applicable subparagraphs below. Percentages of maximum dry unit weight are examples only; revise to suit Project. Delete scarifying and recompacting existing subgrade when proof rolling will suffice.
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 6 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent.
   3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Walks: Plus or minus 1 inch.
   2. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
   1. Place base course material over subbase.
   2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
   3. Shape subbase and base to required crown elevations and cross-slope grades.
   4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
   5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
   3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02200

SECTION 02282
TERMITE CONTROL

GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SUMMARY

Provide soil treatment for termite control, as herein specified, prior to placement of vapor barrier under concrete work.

SUBMITTALS

Product Data: Submit manufacturer's technical data and application instructions.

QUALITY ASSURANCE

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.

JOB CONDITIONS

Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

SPECIFIC PRODUCT WARRANTY

Furnish written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites and, that if subterranean terminate activity is discovered during warranty period, Contractor will retreat soil and repair or replace damage caused by termite infestation. Provide warranty for a period of 1 years from date of treatment, signed by Applicator and Contractor. This contract shall be renewable annually at the option of the Owner.

PRODUCTS

SOIL TREATMENT SOLUTION

Use an emulsible concentrate termiticide for dilution with water, especially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of following chemical elements and concentrations:

Chloropyrifos ("Dursban TC"); 1.0 percent is water emulsion.

Permathrin ("Dragnet", "Torpedo"); 0.5 percent in water emulsion.

Other solutions may be used as recommended by Applicator if also acceptable to Architect and approved for intended application by jurisdictional authorities. Use only soil treatment solutions which are not injurious to planting.

EXECUTION

APPLICATION

Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

Application Rates: Apply soil treatment solutions as follows:

Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following rates of application:

Apply 4 gallons of chemical solution per 10 lin. ft. to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

Apply one gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

Apply 4 gallons of chemical solution per 10 lin. ft. of trench, for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6" to 8" wide along outside of foundation to a depth of not less than 12". Punch holes to top of footing at not more than 12" o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench.

At hollow masonry foundations or grade beams, treat voids at rate of 2 gal. per 10 lin. ft., poured directly into the hollow spaces.

At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gals. per 10 lin. ft. of penetration.

Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.

Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

Outside building perimeter in a strip at least 2' wide, 1 gallon per 5 square feet.

END OF SECTION

SECTION 02311
ROUGH GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cutting, grading, filling, rough contouring, compacting, and shaping the site around the area ways.

1.2 RELATED SECTIONS

A. Section 01400 – Quality Requirements.
B. Section 02200 – Earthwork

1.3 REFERENCES

A. ASTM C136 - Method For Sieve Analysis of Fine and Coarse Aggregates.
B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
C. ASTM D2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
D. ASTM D2434 - Test Method for Permeability of Granular Soils (Constant Head).
E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.
B. Accurately record actual locations of utilities remaining by horizontal dimensions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Subsoil Fill: Common sandy loam typical to the agricultural area.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.
C. Locate, identify, and protect utilities that remain, from damage.
D. Notify utility company to remove and relocate utilities to allow for the improvements to proceed.
E. Protect above and below grade utilities that remain.
F. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
G. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 FILLING

A. Install Work in accordance with designated requirements.
B. Fill areas to contours and elevations with soil materials.
C. Place fill material on continuous layers and compact.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Slope grade away from building minimum 2 inches in 10 ft unless noted otherwise.
F. Make grade changes gradual. Blend slope into level areas.

3.4 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 6 inches from required elevation.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Field inspection and testing for compaction. Compact to minimum 95 percent of maximum density.

END OF SECTION

SECTION 03100
CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete, shoring, bracing and anchorage for the south entrance and ramp and sidewalks.
B. Form accessories.
C. Form stripping.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 – Cast-In-Place Concrete: Placement of concrete accessories.
B. Section 05500 – Metal Fabrications: Placement of metal fabrications.
C. Division Fifteen: Placement of mechanical items.
D. Division Sixteen: Placement of electrical items.

1.3 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.
B. Section 03300 - Cast-In-Place Concrete.
C. Section 03350 - Concrete Finishing.

1.4 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 318 - Building Code Requirements for Reinforced Concrete.
C. ACI 347 - Recommended Practice For Concrete Formwork.
D. ANSI/ASTM A17.1 - Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks.
E. PS 1 - Construction and Industrial Plywood.

1.5 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and 318.

1.8 REGULATORY REQUIREMENTS

A. Conform to 2000 International Building Code for fabrication, erection and removal of formwork.

1.9 COORDINATION

A. Coordinate work under provisions of section 01300.
B. Coordinate this Section with other Sections of work which require attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: Douglas Fir species; solid one side sound undamaged sheets with clean, true edges.
B. Lumber: SPF species; #2 grade; with grade stamp clearly visible.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Removable snap-off type, metal, fixed length, cone type, with waterproofing washer. 1 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
C. Corners: Chamfer wood strip type; 3/4 x 3/4 inch.
D. Dovetail Anchor Slot: Galvanized steel, 22 gauge thick, foam filled.
E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
F. Waterstops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range,, 6 inches wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION – FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
D. Align joints and make watertight. Keep form joints to a minimum.
E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
F. Provide fillet chamfer strips on external corners of beams and columns.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
B. Locate and set in place items which will be cast directly into concrete.
C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
D. Position recessed reglets for brick veneer masonry anchors to spacing and intervals specified in Section 04820.
E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
F. Install waterstops continuous without displacing reinforcement. Heat seal joints watertight.
G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.
B. Construct and align formwork for elevator hoistway in accordance with ANSI/ASME A17.1.
C. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301.

3.8 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

3.9 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

SECTION 03151
CONCRETE ANCHORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose anchors for horizontal and vertical applications.
B. Adhesive anchors and inserts.
C. Suspended ceiling hanger anchors.
D. Anchors for light duty horizontal applications where holding power is not critical.
E. Deck inserts for threaded rods or bolts.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Concrete that anchors are to be installed in, and other types of cast in place inserts.
B. Section 04810 - Unit Masonry Assemblies: Masonry that anchors are to be installed in.
C. Section 05120 - Structural Steel: Steel members that anchors are to be installed in.

1.3 REFERENCES

A. ASTM A 193/A 193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service; 2001b.
B. ASTM A 194/A 194M - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both; 2001a.
C. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2000.
D. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts; 2000.
E. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2001b.
F. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 1998.
G. ASTM B 695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel; 2000.
H. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1999.
I. ASTM F 436 - Standard Specification for Hardened Steel Washers; 1993 (Reapproved 2000).
J. ASTM F 593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2002.
K. SAE J429 - Mechanical and Material Requirements for Externally Threaded Fasteners; Society of Automotive Engineers; 1999.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Sizes, locations, and spacing.
   2. Installation methods.
C. Engineering Design Data: For each structural application, provide data substantiating specified design requirements, signed by design engineer.

1.5 PROJECT CONDITIONS

A. For adhesive anchors, maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Powers Fasteners, Inc; 2 Powers Square, New Rochelle, NY 10801. ASD. Tel: (914) 235-6300. Fax: (914) 576-6483. www.powers.com.
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS

A. Concrete Anchors - General: Select type and size to achieve required loading capacity using information provided by manufacturer.
   1. If required type is not indicated, select type appropriate to conditions and item being fastened.
   2. If required loading capacity is not indicated on the drawings, determine required loading capacity in

accordance with accepted engineering principles and as required by applicable code.

3. For structural applications, provide engineering design by professional engineer licensed in the State in which the project is located.
4. Use recommended and appropriate safety factors and load reduction factors.
5. For non-structural applications, space anchors as required to support the material being anchored without sagging or deformation.

B. Anchors for Horizontal Light Duty Applications Where Holding Power is Not Critical: Use one of the following:

1. Acceptable Product: Bantam Plug or Fluted Plastic Anchor; injection molded plastic expansion sleeve for sheet metal and wood screws.
2. Acceptable Product: Scru-Lead; tubular lead alloy with flange, for sheet metal and wood screws.
3. Acceptable Product: Fiberplug; tubular shaped braided jute fiber screw anchor with antimonial lead lining, for sheet metal and wood screws.
4. Acceptable Product: Hammer Drive Pins; 1/4 inch (6 mm) diameter knob head pin with 0.14 inch (3.5 mm) shank and 3/8 inch (9.5 mm) diameter washer as tool guide; heat treated carbon steel, plated in accordance with ASTM B 633, SC1, Type III.
5. Acceptable Product: Calk-In; tool-set expansion type, pre-assembled antimonial lead alloy calking sleeve and Zamac alloy internally-threaded expander cone, into which machine bolt or screw is inserted and tightened.
6. Acceptable Product: Lag Shield; Zamac alloy screw style anchor for lag bolts.
7. Acceptable Product: Single; expansion type pre-assembled machine bolt anchor with Zamac alloy expansion shield and internally threaded expander cone.
8. Acceptable Product: Double; dual expansion type pre-assembled machine bolt anchor with twin tubular sleeves bound together with high tension spring steel bands that contain two protruding wedge shaped cones; Zamac alloy.
9. Acceptable Product: Nylon Nailin; driven type, pre-assembled nail drive anchor with nylon body.
    a. Mushroom head carbon steel nail plated in accordance with ASTM B 633, SC1, Type III.
    b. Flat head carbon steel nail plated in accordance with ASTM B 633, SC1, Type III.
    c. Round head carbon steel nail plated in accordance with ASTM B 633, SC1, Type III.
    d. Mushroom head Type 304 stainless steel nail.
10. Acceptable Product: Zamac Nailin; driven type, pre-assembled nail drive anchor with Zamac alloy body.
    a. Mushroom head; carbon steel nail plated in accordance with ASTM B 633, SC1, Type III.
    b. Flat head; carbon steel nail plated in accordance with ASTM B 633, SC1, Type III.
    c. Mushroom head; Type 304 stainless steel nail.

C. Deck Inserts: For installation through deck or forms prior to placement of concrete; different diameters color coded for threaded rods or bolts in sizes from 1/4 inch (6 mm) to 3/4 inch (19 mm) diameter; six-sided impact plate providing resistance to rotation; heat treated carbon steel insert plated in accordance with ASTM B 633.

1. For Steel Deck: Bang-It; for installation in pre-drilled holes, with protective sleeve protruding below deck to prevent applied materials from clogging threads or hiding location.
2. For Wood Forms: Wood-Knocker, color coded flange on surface of concrete after stripping. Prior to pouring concrete over the wood form, place the Wood-Knocker Concrete Insert (break-off nails down) on the surface of the wood form at the desired location. Strike the impact plate of the insert with a hand held hammer, until the plastic color-coded flange is flush with the wood surface.

D. Suspended Ceiling Hanger Anchors: Tie-wire head; use one of the following:

1. Acceptable Product: The Power-Stud; (formerly known as the Rawl-Stud), one piece, wedge type expansion anchor.
    a. Mechanically galvanized carbon steel anchor body with stainless steel wedges.
    b. Stainless steel Type 304.
    c. Stainless steel Type 316.
2. Acceptable Product: Drive; driven type, pre-expanded one-piece unit, heat treated carbon steel, plated in accordance with ASTM B 633, SC1, Type III.
3. Acceptable Product: SPIKE; driven type, pre-expanded one-piece unit that develops compression forces at three different levels in bottom of anchor hole; carbon steel, Grade 8.2, plated in accordance with ASTM B 633, SC1, Type III.
4. Acceptable Product: Lok-Bolt; torqued expansion type; pre-assembled sleeve style, with triple tined

expansion sleeve; carbon steel plated in accordance with ASTM B 633, SC1, Type III.

E. Vertical Rod Anchors: Rod hanger head internally threaded to accept steel threaded rod or threaded bolt; use one of the following:
   1. Acceptable Product: The Power-Stud; (formerly known as the Rawl-Stud), one piece, wedge type expansion anchor.
      a. Mechanically galvanized carbon steel anchor body with stainless steel wedges.
      b. Stainless steel Type 304.
      c. Stainless steel Type 316.
   2. Acceptable Product: Rod Hanger Lok-Bolt; torqued expansion type; pre-assembled sleeve style, with triple tined expansion sleeve; carbon steel plated in accordance with ASTM B 633, SC1, Type III.
   3. Acceptable Product: Vertigo; hardened carbon steel plated in accordance with ASTM B 633, SC1, Type III.
      a. For Wood: Thread forming wood screw; either vertical or side mounting of rod/bolt.
      b. For Steel: Self-drilling, self-tapping screw; either vertical or side mounting of rod/bolt.
      c. For Concrete: Double lead threaded bolt with integral washer, to be installed in hole pre-drilled using matched tolerance bit; vertical mounting of rod/bolt.

F. Capsule Adhesive Anchors: Combination capsule adhesive and hardware; Chem-Stud; chisel pointed threaded rod, reinforcing bar (by Contractor), or internally threaded insert, installed into pre-drilled anchor hole using rotary hammer drill, crushing glass capsule containing two part epoxy acrylate resin (vinyl ester) with quartz aggregate and hardening agent, forming adhesive mortar.
   1. ASTM A307, carbon steel, chisel pointed threaded rod.
   2. ASTM A193, grade B7, chisel pointed threaded rod.
   3. Type 304 stainless steel, chisel pointed threaded rod.
   4. Carbon steel, internally threaded inserts.

G. Capsule Adhesive Anchors: Combination capsule adhesive and hardware; Hammer-Capsule; threaded rod or reinforcing bar (by Contractor), driven into pre-drilled anchor hole, crushing glass capsule containing two part epoxy acrylate resin (vinyl ester) with quartz aggregate and hardening agent, forming adhesive mortar; not requiring spinning action or special tools to mix adhesive.
   1. Capsule shelf life of two years, minimum.
   2. Threaded Rod: ASTM A 307, carbon steel plated in accordance with ASTM B 633, SC1, with Type III clear chromate treatment.
   3. Threaded Rod: ASTM A 193 Grade B7, ASTM A 194 Grade 2H or ASTM A 563 Grade DH nuts, and ASTM F 436 washers; plated in accordance with ASTM B 633, SC1, with Type II yellow chromate treatment.
   4. Threaded Rod: Type 304 stainless steel, passivated.

H. Injection Adhesive: Type recommended by manufacturer for application and use, rated for loadings and anchored items required.
   1. Acceptable Product: AC100 PLUS; two component, all weather, high performance, zero VOC, epoxy acrylate, complying with descriptive requirements of ASTM C 881, Type IV, Grade 3, Classes A, B, and C, except for gel time; mixed and dispensed through motionless, static mixing nozzle and dispensing tool; shelf life of 18 months, minimum.
   2. Acceptable Product: Power-Fast Plus; two component, structural grade, odorless amine based epoxy resin, complying with ASTM C 881, Types I, II, IV, and V, Grade 3, Classes B and C; mixed and dispensed through motionless static mixing nozzle; shelf life of two years, minimum, NSF 61 approved.

I. Anchors and Inserts for Drilled Anchor Holes with Injection Adhesive:
   1. Threaded Rod: ASTM A 307, carbon steel plated in accordance with ASTM B 633, SC1, with Type III clear chromate treated.
   2. Threaded Rod: ASTM A 193 Grade B7, ASTM A 194 Grade 2H or ASTM A 563 Grade DH nuts, and ASTM F 436 washers; plated in accordance with ASTM B 633, SC1, with Type II yellow chromate treatment.
   3. Threaded Rod: Type 304 stainless steel, passivated.
   4. Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

J. General Purpose Anchors: Use one of the following:
1. Acceptable Product: Wedge-Bolt; one piece screw anchor with finished hex head with integral washer, double lead thread, chamfered tip, ratchet teeth on underside of head to be installed in hole pre-drilled using matched tolerance bit; head stamped with diameter and length.
   a. Carbon Steel Wedge-Bolt installed with Wedge-Bit. Plated in accordance with ASTM B 633, SC1, Type III.
   b. Carbon Steel Wedge-Bolt installed with ANSI Drill Bit. Plated in accordance with ASTM B 633, SC1, Type III.
   c. Type 410 Stainless Steel Wedge-Bolt installed with Wedge-Bit.
2. Acceptable Product: Power-Bolt; torque-controlled, self-undercutting type; pre-assembled heavy duty sleeve style, with internal bolt, nylon compression ring, expansion cone with oversized annular ring that expands to undercut the base material.
   a. Hex head, Grade 5 carbon steel, plated in accordance with ASTM B 633, SC1, Type III.
   b. Flat head, Grade 5 carbon steel, plated in accordance with ASTM B 633, SC1, Type III.
   c. Type 303 or 304 stainless steel, ASTM F 593 hex head.
3. Acceptable Product: Power-Stud; torque-controlled, wedge type; one piece body with expansion mechanism consisting of two interlocking independent wedges; head marked with length code; for installation by driving into same diameter hole and expanding by turning nut.
   a. Carbon steel anchor body and wedges, plated in accordance with ASTM B 633, SC1, Type III.
   b. Mechanically galvanized carbon steel anchor body with stainless steel wedges.
   c. Type 304 stainless steel anchor body and wedges.
   d. Type 316 stainless steel anchor body and wedges.
4. Acceptable Product: Lok-Bolt; torque-controlled, expansion type; pre-assembled sleeve style, with nylon compression ring and triple tined expansion sleeve.
   a. Carbon steel plated in accordance with ASTM B 633, SC1, Type III.
   b. Stainless steel.
   c. Head: Hex nut.
   d. Head: Acorn nut.
   e. Head: Round head.
   f. Head: Flat head.
5. Acceptable Product: Set-Bolt; driven deformation type, one piece stud style anchor with bottom-bearing external expansion plug; carbon steel plated in accordance with ASTM B 633, SC1, Type III; attached fixture secured with nut and washer on exposed screw threads.
6. Acceptable Product: SPIKE; driven deformation type, pre-expanded one-piece unit that develops compression forces at three different levels in bottom of anchor hole.
   a. Carbon Steel, Mushroom Head.
   b. Carbon Steel, Flat Head.
   c. Type 316 Stainless Steel, Mushroom Head.
   d. Carbon Steel Pipe Spike.
   e. Carbon Steel Tie Wire.
7. Acceptable Product: Drive; driven deformation type, pre-expanded one-piece unit, heat treated carbon steel, plated in accordance with ASTM B 633, SC1, Type III.
   a. Head: Round (tamperproof).
   b. Head: Flat (tamperproof).
8. Acceptable Product: Zamac HAMMER-SCREW; driven deformation type, pre-assembled nail drive anchor with mushroom style head and Zamac alloy body; Phillips screw head for removal.
   a. Carbon steel screw plated in accordance with ASTM B 633, SC1, Type III.
   b. Type 304 stainless steel screw.
9. Acceptable Product: Zamac NAILIN; driven deformation type, pre-assembled nail drive anchor with Zamac alloy body.
   a. Zinc alloy, mushroom head, carbon steel drive pin.
   b. Zinc alloy, flat head, carbon steel drive pin.
   c. Zinc alloy, mushroom head, stainless steel drive pin.
10. Acceptable Product: Nylon NAILIN; driven deformation type, pre-assembled nail drive anchor with nylon body.

a. Nylon, round head, carbon steel drive pin.
b. Nylon, flat head, carbon steel drive pin.
c. Nylon, mushroom head, carbon steel drive pin.
d. Nylon, mushroom head, stainless steel drive pin.

11. Acceptable Product: TAPPER; one-piece screw anchor.
    a. Carbon steel with white Perma-Seal fluoropolymer coating.
    b. Carbon steel with blue Perma-Seal fluoropolymer coating.
    c. Carbon steel with silver Perma-Seal fluoropolymer coating.
    d. Carbon steel with bronze Perma-Seal fluoropolymer coating.
    e. Type 304 stainless steel.
    f. Type 410 stainless steel.
    g. Carbon steel. Zinc plated
    h. Head: Hex washer.
    i. Head: Flat Phillips.
12. Acceptable Product: Hollow-Set Dropin; tool-set expansion type, pre-assembled tapered slotted expansion sleeve of Zamac alloy with threaded steel expansion cone, into which machine bolt is inserted and tightened.
    a. Expansion Cone: Plated in accordance with ASTM B 633, SC1, Type III.
    b. Expansion Cone: Type 304 stainless steel.
13. Acceptable Product: Steel Dropin; tool-set expansion type, pre-assembled shell style with internal expansion plug, into which machine bolt is inserted and tightened.
    a. Carbon steel, smooth wall
    b. Carbon steel, flange (lipped).
    c. Carbon steel, coil thread.
    d. Type 303 stainless steel, smooth wall.
    e. Type 316 stainless steel, smooth wall.
14. Acceptable Product: Mini Dropin; tool-set expansion type, pre-assembled shell style with internal expansion plug, into which machine bolt is inserted and tightened; embedment of 3/4 inch (19 mm) maximum; carbon steel plated in accordance with ASTM B 633, SC1, Type III. Sizes as required for application.
    a. Size: 1/4 inch (6 mm).
    b. Size: 3/8 inch (9.5 mm).
    c. Size: 1/2 inch (12 mm).
    d. As required.
15. Acceptable Product: Powder actuated drive pins and threaded studs, with guide washers or flutes; for standard low-velocity installation tools.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations and as required by applicable code.
B. Apply anchor items neatly, with anchor mounted plumb and level unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. The Architect/Engineer reserves the right to require the anchor manufacturer's representative to demonstrate proper installation procedures for post-installed anchors and to observe Contractor's installation procedures, at no extra cost to Owner.
B. The Architect/Engineer reserves the right to require pullout or shear tests to determine adequacy of anchors, at no extra cost to Owner

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.
B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
C. ACI SP-66 - ACI Detailing Manual; 2004.
D. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
E. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2006 (Reapproved 2011).
F. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
G. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
I. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2006 (Reapproved 2011).
J. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
K. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
L. CRSI (DA4) - Manual of Standard Practice; 2009.
M. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
B. Reinforcing Steel Mat: ASTM A704/A704M, using ASTM A615/A615M, Grade 40 (40,000 psi) steel bars or rods, unfinished.
C. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
D. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
   1. WWR Style: As indicated on drawings.
E. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
B. Welding of reinforcement is not permitted.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, wire fabric and accessories for cast-in-place.

1.2 RELATED SECTIONS

A. Section 03100 – Concrete Forms and Accessories.
B. Section 03300 – Cast-In-Place Concrete.
C. Section 04230 – Reinforced Concrete Unit Masonry.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.
B. ACI 318 - Building Code Requirements for Reinforced Concrete.
C. ACI SP-66 - American Concrete Institute - Detailing Manual.
D. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
G. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
H. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
I. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
J. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
K. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
L. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.4 SUBMITTALS

A. Submit under provisions of Section 01330
B. Shop Drawings: Indicate bar sizes, spacings, and locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice ACI 301, ACI SP-66, ACI 318.
B. Maintain one copy of each document on site.
C. Submit certified copies of mill test report of reinforcement materials analysis.
D. Provide Architect/Engineer with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

1.6 QUALIFICATIONS

A. Welders' Certificates: Submit under provisions of Section 01400 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.7 COORDINATION

A. Coordinate work under provisions of Section 01300.
B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, unfinished.
B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704, ASTM A615, Grade 60; steel bars or rods, unfinished.
C. Stirrup Steel: ANSI/ASTM A82, unfinished.
D. Welded Steel Wire Fabric: ASTM A185 in flat sheets ; unfinished.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gauge annealed type.
B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture. Brick batts may be used at slab on grade; 1/2 brick minimum.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice, ACI SP-66, ACI 318, and ANSI/ASTM A184.
B. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.
D. Maintain concrete cover around reinforcing as indicated on structural drawings.
E. Conform to applicable code and plans for concrete cover over reinforcement.
F. Bond and ground all reinforcement to requirements of Division 16.

3.2 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

3.3 SCHEDULES

A. Reinforcement for Foundation Wall, Framing Members and Slab-on-Grad: Deformed bars.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.
B. Floors and slabs on grade.
C. Concrete reinforcement.
D. Joint devices associated with concrete work.
E. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
B. Section 03 2000 - Concrete Reinforcing.
C. Section 07 9200 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.
D. Section 07 9005 - Joint Sealers: Sealants for saw cut joints and isolation joints in slabs.
E. Section 32 1313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. TxDOT Item 420, Concrete Structures, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2004 edition.
B. TxDOT Item 421, Hydraulic Cement Concrete, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2004 edition.
C. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
D. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
E. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
F. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
G. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
H. ACI 305R - Hot Weather Concreting; 2010.
I. ACI 306R - Cold Weather Concreting; 2010.
J. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
K. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
L. ACI 347R - Guide to Formwork for Concrete; 2014.
M. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
N. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
O. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
P. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
T. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
U. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
V. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
W. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.

X. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.
Y. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
Z. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.
AA. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
AB. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Mix Design: Submit proposed concrete mix design.
C. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with Item 420 TxDOT 2004 Standard Specifications.
B. Perform work in accordance with Item 421 TxDOT 2004 Standard Specifications.
C. Perform work of this section in accordance with ACI 301 and ACI 318.
    1. Maintain one copy of each document on site.
D. Follow recommendations of ACI 305R when concreting during hot weather.
E. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 1000.
B. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
C. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
    1. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 2000.
B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
C. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
    1. WWR Style: As indicated on drawings.
D. Reinforcement Accessories:
    1. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Provide concrete materials in accordance with Item 421 TxDOT 2004 Standard Specifications.
B. Cement: ASTM C150/C150M, Type I - Normal Portland type.
C. Fine and Coarse Aggregates: ASTM C 33.
D. Fly Ash: ASTM C618, Class C or F.
E. Calcined Pozzolan: ASTM C618, Class N.
F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
G. Water: Clean and not detrimental to concrete.
H. Fiber Reinforcement: ASTM C1116/C1116M.

2.04 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
    1. Complying with ASTM C881/C881M and of Type required for specific application.
B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
    1. Material: ASTM D1751, cellulose fiber.
    2. Material: ASTM D1752 sponge rubber (Type I).
    3. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.

4. Manufacturers:
   a. W.R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com.
   b. W.R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com.

C. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.

2.05 CONCRETE MIX DESIGN

A. Mix design in accordance with Item 421 TxDOT 2004 Standard Specifications.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.

C. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.

2.06 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Comply with requirements of Item 420 TxDOT 2004 Standard Specifications.

B. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.03 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

E. Contraction Joint Devices: Use preformed joint device, with top set flush with top of slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.04 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.05 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Surfaces Not in Contact with Forms:
   1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   2. Final Curing: Begin after initial curing but before surface is dry.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
B. Provide free access to concrete operations at project site and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
D. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.09 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. Extent of concrete work is shown on drawings.

1.3 SUBMITTALS

A. Product Data: Submit data for non-proprietary materials and items, including admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

B. Shop Drawings; Reinforcement: Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACT 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. ACT 301 "Specifications for Structural Concrete for Buildings".
   2. ACT 318 "Building Code Requirements for Reinforced Concrete".
   3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Materials and installed work may require testing and retesting at anytime during progress of work. Retesting of rejected materials for installed work, shall be done at Contractor's expense.

1.5 PROJECT CONDITIONS

A. Protect adjacent finish materials against spatter during concrete placement.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, "Alamo Cement" or equal. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
   1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
   2. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.

C. Water: Drinkable.

D. Water-reducing Admixture: ASTM C 194, Type A, and containing not more than 0.1 percent chloride ions.
   1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
      a) "WRDA Hycol"; W.R. Grace.
      b) "PSI N"; Gifford-Hill/American Admixtures
      c) "Eucon WR-75"; Euclid Chemical Co.
      d) "Pozzolith Normal"; Master Builders.
      e) "Plastocrete 160"; Sika Chemical Corp.
      f) "Chemtard"; Chem-Masters Corp.
      g) "Pro-Kete-N"; Protex Industries, Inc.

E. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.
   1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
      a) "Accelguard 80"; Euclid Chemical Co.
      b) "Pozzolith High Early"; Master Builders.
      c) "Gilco Accelerator"; Gifford-Hill/America Admixtures

F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a) "Edoco 20006"; Edoco Technical Products.
   b) "Pozzolith Retarder"; Master Builders.
   c) "Eucon Retarder 75"; Euclid Chemical Co.
   d) "Daratard"; W.R. Grace.
   e) "PSI R"; Gifford-Hill/American Admixtures.
   f) "Plastiment"; Sika Chemical Co.
   g) "Protard"; Protex Industries, Inc.

G. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chlorine ions are not permitted.

2.2 RELATED MATERIALS

1. None

2.3 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACT 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
   1. 3000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained). For structural slabs.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Admixtures:
   1. Use water-reducing admixture in concrete as required for placement and workability.
   2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
   1. Ramps, slabs, and sloping surfaces: Not more than 5".
   2. Reinforced foundation systems: Not less than 3" and not more than 5".
   3. Other concrete: Not less than 3" nor more than 5".

2.4 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.2 JOINTS:

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, located so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.4 CONCRETE PLACEMENT

A. Replacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or casting. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
B. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
C. General: Comply with ACT 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACT 309.
G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly space locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
J. Bring slab surfaces to correct level within straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
K. Maintain reinforcing in proper position during concrete placement operations.
L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACT 306 and as herein specified.
M. When air temperature has fallen to or is expected to fall below 40 deg F (4deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.
N. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
O. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix design.
P. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACT 305 and as herein specified.
Q. Cool ingredients before mixing to maintain concrete temperature at time of placement below 95º deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
R. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
S. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
T. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.5 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

3.6 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
C. For exposed-to-view surfaces blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
D. Repair of Formed Surfaces: Removed and replaced concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
G. Correct high area in unformed surfaces by grinding, after concrete has cured at least 4 days.
H. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
I. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
J. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2" parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
K. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.
L. Repair methods not specified above may be used, subject to acceptance of Architect.

3.7 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Owner’s Agent will employ a testing laboratory to perform test and to submit test reports.
B. Sampling and testing for quality control during placement of concrete shall include the following, as directed by Architect.
C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
D. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
E. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
F. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens are required.
G. Compression Test Specimen: ASTM C 31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
H. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu yds. plus additional sets for each 50 cu yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. When frequency of testing will provide less than 5 strength test for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
I. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

J. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

K. Test results will be reported in writing to Architect, Structural Engineer, and Contractor within 24 hours after tests. Reports of compressive strength test shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

L. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

M. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

N. See Structural Plans for additional requirements.

END OF SECTION

SECTION 03350
CONCRETE FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Finishing of exposed concrete.

1.2 RELATED SECTIONS
A. Section 03100 - Concrete Forms and Accessories.
B. Section 03300 - Cast-In-Place Concrete.

1.3 REFERENCES
A. ACI 302 - Guide for Concrete Floor and Slab Construction.

1.4 SUBMITTALS
A. Submit under provisions of Section 01330.
B. Product Data: Provide data on concrete colorer, sealer, and slip resistant treatment, compatibilities, and limitations.

1.5 MAINTENANCE DATA
A. Submit under provisions of Section 01700.
B. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.6 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 301 and ACI 302.
B. Maintain one copy of each document on site.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
B. Deliver materials in manufacturer's packaging including application instructions.

1.8 COORDINATION
A. Coordinate work under provisions of Section 01300.
B. Coordinate the work with concrete placement and curing.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify site conditions under provisions of Section 01300. Verify that surfaces are acceptable to receive the Work of this section.

3.2 MONOLITHIC SLAB FINISHES
A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
C. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F 35 - F 25. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
D. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin firm finish coating system.
E. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface procedures a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of F 35 - F 25. Grind smooth surface defects which would telegraph through applied floor covering system.
F. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
G. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
H. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristly broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

I. See architectural for stained concrete locations.

3.3 TOLERANCES

A. After placing slabs, plane surface to tolerances for floor flatness (F) of 35 and floor levelness (F1) of 25. Slope surfaces uniformly to drains where requires. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

END OF SECTION

SECTION 03390
CONCRETE CURING

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Initial and final curing of horizontal concrete surfaces.

1.2 RELATED SECTIONS
A. Section 03300 – Cast-In-Place Concrete.
B. Section 03350 - Exposed Concrete Finishing.

1.3 REFERENCES
A. ACI 301 - Structural Concrete for Buildings.
B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.
C. ACI 308 - Standard Practice for Curing Concrete.
D. ASTM C171 - Sheet Materials for Curing Concrete.
E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
F. ASTM D2103 - Polyethylene Film and Sheeting.

1.4 SUBMITTALS
A. Submit under provisions of Section 01300.
B. Product Data: Provide data on curing compounds, product characteristics, compatibility and limitations.
C. Manufacturer's Installation Instructions: Indicate criteria for preparation and application.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 301 and ACI 302.
B. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products under provisions of Section 01600.
B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS
A. Membrane Curing Compound Type A: ASTM C309 Type 1.
B. Polyethylene Film Type B: ASTM C171, 6 mil thick, clear.
C. Water: Potable and not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify substrate conditions under provisions of Section 01039.
B. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES
A. Cure floor surfaces in accordance with ACI 308.
B. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 4 days.
C. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
D. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in two coats with second coat applied at right angles to first.
E. Polyethylene Film: Spread Polyethylene Film over floor slab areas, lapping edges and sides and sealing with pressure sensitive tape; cover with plywood; maintain in place for 7 days.

3.3 PROTECTION OF FINISHED WORK
A. Protect finished Work under provisions of Section 01500.
B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 04230
REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
B. Requirements of Section "Unit Masonry" apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of reinforced unit masonry work is indicated on drawings and in schedules.

1.3 SUBMITTALS:

A. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this section.
B. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A 615, Except as otherwise indicated.
C. Provide Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.
D. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT:

A. General: Clean reinforcement of loose rust, mill scale, earth, ice, or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).
C. For columns, piers, and pilasters, provide a clear distance between vertical bars as indicated, but not less than 1-1/2 times the nominal bar diameter or 1-1/2", whichever is greater. Provide lateral ties as indicated.
D. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars of attaching to dowels, lap ends, place in contact and wire tie.
E. Provide not less than minimum lap indicated, or if not indicated, as required by governing code.
F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.
G. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fire-proofing, pipe enclosures, and other special conditions.
H. Anchoring: Anchor reinforced masonry work to supporting structure they indicated.
I. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.2 INSTALLATION, GENERAL:

A. Refer to Section "Unit Masonry" for general installation requirements of unit masonry.
B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
C. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any).
D. Brace, tie, and support as required to maintain position and shape during
E. Construction and curing of reinforced masonry.
F. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.
G. Allow not less than the following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period.
    a. 10 days for girders and beams.

b. 7 days for slabs.
c. 7 days for reinforced masonry soffits.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:
1. Do not wet concrete masonry units (CMU).
2. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

B. Walls:
1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams, and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
4. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.

C. Low-Lift Grouting:
1. Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters or 10 ft.
3. Lay CMU to maximum pour height. Do not exceed 4' height, or if bond beam occurs below 4' height stop pour at course below bond beam.
4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
5. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beam; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

D. High-Lift Grouting:
1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3" and 10 sq. in., respectively.
2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
3. Use units with one face shell removed and provide temporary supports for units
4. above, or use header units with concrete brick supports, or cut openings in one face shell.

E. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
F. Limit grout lifts to a maximum height of 4' and grout pour to a full height of wall, unless otherwise indicated.
G. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters or 10'.
H. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
I. Place horizontal beam reinforcement as the masonry units are laid.
J. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
K. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
L. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

M. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 4'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.
N. Place grout in lintels or beams over openings in one continuous pour.
O. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.
P. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
B. Structural steel is that work defined in America Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
D. Refer to Division 3 for anchor bolt installation in concrete; Division 4 for masonry.
E. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
F. Promptly remove and replace materials or fabricated components which do not comply.
G. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.
B. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of each weld.
C. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.

1.4 QUALITY ASSURANCE

A. Code and Standards: Comply with provisions of following, except as otherwise indicated:
B. AISC "Code of Standard Practice for Steel Buildings and Bridges".
C. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings".
D. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
E. AISC "Specifications for Architecturally Exposed Structural Steel".
F. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
G. American Welding Society (AWS) D1. "Structural Welding Code - Steel".
H. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
I. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
J. Provide certification that welders to be employed in work have satisfactory passed AWS qualification tests.
K. If recertification of welders is required, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free or surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.
B. Structural Steel Shapes, ASTM A572
C. Plates and Bars: ASTM A36.
D. Cold-Formed Steel Tubing: ASTM A 500, Grade B.
E. Headed Stud-Type Shear Connectors: ASTM A 108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.
F. Anchor Bolts: ASTM A 307, nonheaded type unless otherwise indicated.
G. Adhesive Anchors: Simpson “SET” Adhesive Anchor System
H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
I. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
J. Direct tension indicator washers may be used at Contractor's option.
K. Electrodes for Welding: Comply with AWS Code.
L. Structural Steel Primer Paint: GPA - 313.
M. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CE-CRD-C621.
N. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    1. Euco N.S.; Euclid Chemical Co.
    2. Crystex; L & M Construction Chemicals
    3. Masterflow 713; Master Builders
    4. Five Star Grout; U.S. Grout Corp.
    5. Upcon; Upco Chem. Div., USM Corp.
    6. Propak; Protex Industries, Inc.
    7. Set Non-Shrink; Set Products, Inc.

2.2 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
D. Connections: Weld or bolt shop connections, as indicated.
E. Bold field connections, except where welded connections or other connections are indicated.
F. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.
G. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.
H. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or ASTM A325 or A490 bolts” (RCRBSJ).
I. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
J. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
K. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
L. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

B. Do not paint surfaces which are to be welded.
C. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
D. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
E. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods which result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 EXECUTION

3.1 ERECTION

A. Surveys. Employ a land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.
B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
C. Temporary Planking: "OSHA approved" temporary planking and working platforms as necessary to effectively complete work.
D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
E. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
F. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
G. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
H. Field Assembly: Set structural frames accurately to lines and elevation indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
I. Level and plumb individual members of structure within specified AISC tolerances.
J. Splice members only where indicated.
K. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
L. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
M. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
N. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
O. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
P. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.2 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. Contractor shall pay for such services from the testing allowance specified in Division 1.
B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
C. Provide access for testing agency to places where structural work is being fabricated or produced so that required inspection and testing can be accomplished.
D. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

E. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Open-web K-series steel joists.
2. Joist accessories.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for installing bearing plates in unit masonry.
2. Division 5 Section "Metal Fabrications" for furnishing steel bearing plates.
3. Division 9 Section "Painting" for prime painting.

C. Structural Performance: Provide special joists and connections capable of withstanding the design loads within limits and under conditions required by the Steel Joist Institute. Special loading requirements are indicated on the structural drawings.

D. Design joists to withstand design loads with total load deflections no greater than the following:

1. Roof Joists: Vertical deflection of 1/360 of the span.

1.3 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.

B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.6 SEQUENCING

A. Deliver steel bearing plates and other devices to be built into concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for chord and web members.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

D. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements in FS TT-P-664.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.

1. Joist Type: K-series steel joists.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications**."**

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications."

1. Furnish additional erection bridging if required.

C. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

D. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

E. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.

3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections.

B. Field welds will be visually inspected according to AWS D1.1.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:

1. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories**,** bearing plates and abutting structural steel.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Noncomposite vented form deck.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.
B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
D. Welding Certificates: Copies of certificates for welding procedures and personnel.
E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Mechanical fasteners.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
C. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Deck:

   a. Nucor Corp.; Vulcraft Div.
   b. Roof Deck, Inc.

c. United Steel Deck, Inc.
d. Verco Manufacturing Co.
e. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:

1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: per plan.
3. Profile Depth: per plan.
4. Design Uncoated-Steel Thickness: per plan
5. Span condition: As indicated.
6. Side Laps: per plan.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
E. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
C. Locate decking bundles to prevent overloading of supporting members.
D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 18 inches apart, maximum 12 inches apart in the field of the roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions of FM Loss Prevention Data Sheet 1-28.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling No. 12 diameter or larger carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.4 REPAIRS AND PROTECTION

A. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400
METAL STUD FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. ASTM A123-Zinc (Hot-Dip Galvanized) coating on Iron and Steel Products.
B. ASTM A525 - General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process.
C. ASTM A591 - Steel Sheet, Cold-Rolled, electrolytic, Zinc-Coated
D. ASTM C645 - non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring channels for Screw Application of Gypsum Board.
E. ASTM C754-Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-resistant Gypsum Board.
F. GA 203-Installation of Screw-type Steel Framing Members to Receive Gypsum Board.
G. SSPC (Steel Structures Painting Council)-Steel Structures Painting Manual.
H. Design system to accommodate construction tolerances, defection of building structural members, and clearances of intended openings.

1.2 SECTION INCLUDES

A. Formed mental stud framing and furring channels, top and bottom runners, internal bracing and blocking, and ceiling furring channels.
B. Framing accessories.
C. Acoustical Sealant under metal suds at floors and walls.
D. Framing at Gypsum Plaster Soffits.

1.3 RELATED SECTIONS

A. Section 05500 - Metal Fabrications attached to stud framing.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.
C. Product Data: Provide data describing standards framing member materials and finish, product criteria, load charts and limitations.
D. Manufacturer’s Installation Instructions: Indicate special procedures, and conditions requiring special attention.

PART 2 - QUALITY ASSURANCE

A. Perform work in accordance with GA 203 and ASTM C754.
B. Maintain one copy of each document on site.

2.2 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this section with minimum three years documented experience.
B. Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Texas.

2.3 COORDINATION

A. Coordinate work under provisions of Section 01039.
B. Coordinate with the placement of components within the stud framing system.
C. Furring and Bracing Members: Of same materials as studs; thickness to suit purpose.
D. Metal Framing materials.
   1. 6 inch SJ (Structural)-18 gauge at all exterior perimeter wall framing.
   2. 6 inch ST - 25 gauge interior partitions.
   3. 3-5/8 inch ST - 25 gauge interior partitions.

4. 18 gauge framing at door and window, head and jamb framing sized as indicated on drawing.
5. "Z" Furring channel - 1-1/2 inch 20 gauge; install in locations as indicated on drawings.
6. Resilient Channels as indicated on the drawings.

2.4 FABRICATIONS

A. Fabricated assemblies of framed sections to sizes and profiles to sizes and profiles required; with framing members fitted, reinforced and braced to suit design requirements.

2.5 FINISHED

A. Studs: Galvanized to G60 coating class.
B. Tracks and Headers: Galvanized to G60 coating Class.
C. Accessories: Same finish as framing members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01039.
B. Verify that conditioners are ready to receive work.
C. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
D. Install studs vertically at 16 inches o.c.
E. Install all stud framing in accordance with UL and Gypsum Association design designations as indicated in the specifications and on the drawings.
F. Align stud web openings horizontally.
G. Secure studs to tracks using fastener method. Do not weld.
H. Stud splicing not permissible.
I. Fabricated corners using a minimum of three studs.
J. Double stud at wall openings, door and window jambs. Not more than 2 inches from each side of opening.
K. Brace stud framing system rigid.
L. Coordinate erection of studs with requirements of door frames, windows frames, and blocking for surface mounted items; install supports and attachments.
M. Coordinate installation of wood blocking with electrical and mechanical work to be placed within or behind stud framing.
N. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, cabinets, toilet accessories, chalkboard and tack boards, signage and hardware.
O. All partitions extend through the ceiling to the deck above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
P. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.

3.2 ERECTION TOLERANCES

A. Maximum Variations From True Position: 1.8 in.
B. Maximum Variations of any Member from Plane: 1.8 in.
C. Maximum Variation From Plumb: 1.16 in.

3.3 SCHEDULE OF INSTALLATION

A. 1. Coordinate installation of walls to receive gypsum board finish to roof deck, all walls shall be taped and floated to the underside of the deck prior to the installation of the ceiling system.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.
B. Extent of metal fabrications is indicated on drawings.
C. Types of work in this section include metal fabrications for:
   1. Rough hardware.
   2. Loose steel lintels
   3. Miscellaneous framing and supports.
   4. Structural steel is specified in another section within Division 5.

1.3 SYSTEM PERFORMANCES

A. Structural Performances: Engineer and provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated:
   1. Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
   2. Concentrated loads of 250 lbs. applied at any point in any direction.
   3. Uniform load of 50 lbs. per linear ft. applied simultaneously in both vertical and horizontal directions.
   4. Concentrated and uniform loads above need not be assumed to act
   5. concurrently.
   6. Guards: Intermediate rails, capable of withstanding a uniform load of 25 lb. per sq. ft. of gross areas of guard, including any open areas, of which they are a part.
B. Above load need not be assumed to be acting concurrently with uniform horizontal loads on toprails of railing assembly in determining stress on guard supporting members.

1.4 QUALITY ASSURANCE

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details, and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
C. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations and letter certifying compliance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ferrous Metals:
   1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
   2. Steel Plates, Shapes, and Bars: ASTM A36.
   3. Steel Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A50.
   4. Steel Pipe: ASTM A53; Type and grade (if applicable) as selected by fabricator and as required for design loading; galvanized; standard weight (schedule 40), unless otherwise indicated.
   5. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
   6. Concrete Inserts; Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A 153.
B. Grout:
   1. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and

exterior applications of type specified in this section.

C. Fasteners:
   1. As recommended by fabricator's engineer.
D. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.
E. Concrete Fill:
   1. Concrete Materials and Properties: Comply with requirements of Division-3 section "Concrete Work" for normal weight, ready-mix concrete.
F. Non-Slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non-glazing; unaffected by freezing, moisture or cleaning materials.

2.2 FABRICATION, GENERAL

A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
B. For Exposed Work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/8". Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grid exposed welds smooth and flush to match and blend with adjoining surfaces.
D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
F. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
   1. ASTM A 123 for galvanized rolled, pressed and forged steel shapes, plates, bars, and strip 1/8" thick and heavier.
   2. ASTM A 386 for galvanizing assembled steel products.
H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide week holes where water may accumulated.

2.3 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items as specified in Division-6 sections.
B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 LOOSE STEEL LINTELS

A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit were indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.
B. Galvanize loose steel lintels to be installed in exterior walls.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
B. Fabricate miscellaneous units to sizes, shapes, and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricated from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware and similar items.
C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish insets if units must be installed after concrete is placed.

PART 3 EXECUTION

3.1 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors,

which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION

A. General:
   1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrication to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts wood screws, and other connectors as required.
   2. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation, of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in form work for items which are to be built into concrete masonry or similar construction.

B. Fit exposes connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposes joint, but cannot be shop welded because of shipping size limitations. Grind exposes joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication.

C. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

D. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUST AND CLEAN

A. For galvanize surfaces: Clean field welds, bolted connections and abraded areas and apply of galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05 50 00
MISCELLANEOUS METAL WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Miscellaneous Metal Work indicated on the Drawings and specified herein.

B. Examination: Carefully examine the Drawings and Specifications and include all Miscellaneous Metal Work not distinctly specified in other sections, or noted on the Drawings as being provided by other Trades.

C. Miscellaneous Metal Products: No attempt is made to enumerate or describe each item of the Work, but simply to describe major items, certain special items, and general construction requirements for all items. Work includes, but is not necessarily limited to the following:

1. Anchors.

2. Anchor Bolts and Pipe Sleeves.

3. Lintels.

4. Miscellaneous Steel Frames and Curbs.

5. Steel Ladders - furnish and install.

D. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Indoor Air Quality Requirements - Section 01 81 19. AIR BORNE PRODUCTS

3. Concrete Reinforcing - Sections 03 00 50 and 03 30 00.

4. Masonry Reinforcing - Section 04 23 00.

5. Structural Steel (including Roof Opening Curb Steel) - Section 05 12 00.

6. Cold-Formed Metal Framing - Section 05 40 00.

8. Rough Carpentry - Section 06 10 00.

9. Roof and Wall Specialties and Accessories - Section 07 70 00.

10. Hollow Metal Doors and Frames - Section 08 11 13.

11. Door Hardware - Section 08 71 00.

12. Gypsum Wallboard - Section 09 29 00.

13. Acoustical Panel Ceilings - Section 09 51 13.

14. Paints and Coatings - Section 09 90 00.

E. Work Furnished but not installed:

1. Items anchored (not bolted) to Concrete and Masonry Work.

2. Items as specified herein for installation by others.

1.02 DESIGN REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements for ASTM Standard E985 for structural performance, based on testing performed in accordance with ASTM Standards E894 and E935.

B. Accessibility Guidelines: Handrails required to be accessible to persons with disabilities shall comply with Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. Reference Specifications: Except as otherwise specified herein, materials and workmanship shall conform to the following current specifications as amended to date.

1. All applicable Local Building Codes and Ordinances.

2. “Specifications for Structural Steel Buildings”, and “Commentary” thereon, as adopted by the American Institute of Steel Construction, Inc. (AISC), March 9, 2005.

3. American Welding Society (AWS), D1.1, Structural Welding Code - Steel.

4. "Standard Specifications for Open Web Steel Joists" as adopted by the Steel Joist Institute (SJI) and the American Institute of Steel Construction, Inc., (AISC).

1.04 CERTIFICATION OF WELDERS

A. Current and valid certification qualified by a recognized, Independent Laboratory shall be furnished to Architect for all welders working on fabrication and/or erection PRIOR to starting Work. All welding shall be performed by welders who have qualified by tests in accordance with AWS "Standard Qualification Procedure", to perform the type of Work required.

1.05 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Shop Drawings:

1. Prepare completely detailed Shop Drawings showing all items to be provided, and submit reproducibles to the Architect for review.

2. Prepare completely detailed Shop Drawings showing details for cutting, fabricating, and connecting all pieces. Do not duplicate Design Drawings for use as Shop Drawings. Duplication of Design Drawings shall be grounds for rejection.

3. Where connections are not shown on the Drawings, connections shall be designed and detailed on the Shop Drawings, and sealed by a Registered Professional Structural Engineer in the State of the proposed Project, retained and paid by the steel fabricator.

4. Provide separate Shop Drawings for erection.

5. Prepare Shop Drawings in accordance with "AISC - Detailing for Structural Steel", latest edition, using a marking system compatible with, and referenced to, the marking system used on the Design Drawings.

6. Indicate welding by using AWS symbols, showing type, size and location of all welds. Provide auxiliary views of welds as required to clarify the welded connections.

7. Formally check all Shop Drawings before forwarding to Architect.

C. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

1.06 QUALITY CONTROL

A. Testing Agency Services: Contractor may engage at his expense, a separate testing agency for information and guidance, to ascertain that all new materials are furnished, fabricated and installed in accordance with all requirements of the Contract Documents. The testing agency shall send reports of all inspections to the Architect, Owner, and General Contractor.

1.07 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

1.08 MATERIAL DELIVERY, STORAGE & HANDLING

A. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART 2 - PRODUCTS

2.01 Substitution

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MATERIALS

A. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than the following:

1. W-Shapes: 60 percent.

2. Channels, Angles, M, S -Shapes: 60 percent.

3. Plate and Bar: 25 percent.

4. Cold-Formed Hollow Structural Sections: 25 percent.

5. Steel Pipe: 25 percent.

6. All Other Steel Materials: 25 percent.

C. Steel Rolled Plates and Shapes: Fabricated from new open hearth structural steel conforming to ASTM A36 - Standard Specification for Carbon Structural Steel.

D. Steel Pipe: ASTM Standard A53, Type S, Grade A, Schedule 40, unless otherwise noted.

E. Steel Tubing: Cold rolled, electric resistance welded, carbon steel, hollow, structural steel tubing, fabricated from steel having properties complying with ASTM A500 - Standard Specification for Cold- Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. Hi-Tensile Bolts: Heavy hex type structural bolts conforming with ASTM Standard A325, with matching heavy hex type nuts, 3/4" minimum diameter, of lengths required for connections, with hardened steel washers.

G. Standard Bolts and Anchor Bolts: Unfinished bolts conforming to ASTM Standard A307, Grade A, with hexagon heads and nuts where exposed in the finish Work.

H. Expansion Bolts: Hilti® Kwik Bolt 3 Expansion Anchor as manufactured by Hilti, Inc., 5400 South 122nd. East Avenue, Tulsa, OK 74146, (866)445-8827, (800)879-8000 or (918)252-6000; www.us.hilti.com.

1. Comparable Products: Expansion bolts by the following manufacturer with comparable products of equivalent capacity may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

a. Power-StudÔ as manufactured by Powers Fasteners, Inc., 2 Powers Lane, Brewster, NY 10509, (800)524-3244 or (914)235-6300; www.powers.com.

I. Welding Electrodes: Series E-60 or E-70, AWS A5.1 or A5.5.

J. Galvanizing: Provide zinc coating where indicated on the Drawings. Galvanizing shall be in accordance with ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized)

Coatings on Iron and Steel Products and/or ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, not less than 1.25 oz./sq.ft.

K. Priming Paints: Provide one (1) of the following manufacturers and products, “lead and zinc chromate free” rust inhibiting priming paint, subject to review by the Architect. Substitutions will not be permitted.

1. Manufacturers:

a. ICI Paints, Devoe® High Performance Coatings, Strongsville, OH, (800)654-2616; www.devoecoatings.com.

b. PPG Architectural Finishes, 400 S. 13th Street, Louisville, KY 40203, (800)441-9695; www.ppghpc.com.

c. Tnemec, Inc., 6800 Corporate Drive, Kansas City, MO 64120, (800)863-6321; www.tnemec.com.

2. Ferrous Metal Paint Product:

a. ICI Paints, Devoe® High Performance Coatings, DEVSHIELD™ 4130 Rust Penetrating Metal Primer, Light Gray.

b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Rust Inhibitive Steel Primer 6-208 Red.

c. Tnemec, Inc., Tnemec Primer Series 10, 99 Red.

3. Galvanized Steel Paint Product:

a. ICI Paints, Devoe® High Performance Coatings, DEVGUARD™ 4160 Multi-Purpose Tank & Structural Primer, White.

b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Galvanized Steel Primer 6-209, White.

c. Tnemec, Inc., Hi-Build Epoxoline Series 66, White.

2.02 CONNECTIONS AND WORKMANSHIP

A. General: Weld all shop connections, bolt or weld all field connections unless otherwise noted or specified. Provide all clips, lugs, brackets, straps, plates, bolts, nuts, washers, required for complete fabrication and erection. Use connections of type and design required by forces to be resisted, and to provide secure fastening. Shop welded steel bolts shall be welded to sides and bottom of steel members, not at top of member.

B. Bolting: In bolting, draw-up bolts or nuts tight, and deform threads where possible. Use bolts of lengths required so that bolts do not project more than 1/4" beyond face of nut. Do not use washers unless specified.

C. Welding:

1. Perform all welding by the electric arc method, in accordance with the recommendations of the American Welding Society (AWS). Welds shall be solid and homogeneously a part of the metals joined, free from pits or incorporated slag or scale. Surfaces of weld shall be smooth and regular, and shall be of full area indicated or required to develop the required strength of the joint.

2. Only welders and welding operators who have been tested and certified in accordance with Appendix A, AWS D1.0, and the applicable provisions of AWS D1.0 will be permitted. All operators shall pass all applicable qualification tests while in the current and continuous employment of the fabricator or erector regardless of previous qualifications and certifications.

3. Perform all shop and field welding by the shielded metal-electric arc process. Use qualified welders. Provide all necessary jigs and holding devices for shop welding. Dog or clamp down all Work to prevent distortion during welding.

4. Design weld details and procedures so as much shop Work as possible is performed in the flat and horizontal position. Avoid undercutting, insufficient throat or leg, lack of fusion and splattering. Prepare welding procedure specifications and diagrams for each weld joint, and use in the Work. Assign each joint a procedure designation number or code. Show the number or code in the tail or each welding symbol in the Shop Drawings. Qualify non-prequalified welds in accordance with Appendix A, AWS D1.0. Where a standard weld type is repeated throughout the Work, the procedure designation or code may be indicated by general note or reference on each Shop Drawing where that weld type appears.

5. Make fillet welds larger than 5/16" in not less than two (2) passes. After each pass, remove the slag coating entirely before starting next pass. Do not use fillet welds smaller than 1/4" unless the thickness of the connected material requires the use of 3/16" weld. Add approximately 3/4" to the theoretical length of all intermittent welds as an allowance for craters. Fill all craters.

6. Structural welds shall not be less than 3" in length unless otherwise approved on Shop Drawings.

7. Welds of all metal fabrications exposed in the finish Work shall be ground smooth, flush with adjacent surfaces, filleted at angular connections, and suitably prepared for final finish painting, unless otherwise specified.

D. Galvanized Steel Products: Field touch-up all damaged areas of galvanized coating, damaged during erection including field abrasions and welds, with zinc-rich galvanized coating repair paint according to ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Provide nylon/polyester or natural bristle brush application of paint product in accordance with the manufacturer's recommendations and instructions. Surfaces shall be dry, free from oil, dirt, dust, mill scale or other contaminants to ensure adequate adhesion.

1. Galvanized Coating Repair Paint: Zinc Clad® VI Water Based Organic Zinc-Rich Epoxy (VOC content of less than 105 grams/liter), as manufactured by The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com

2. Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

E. Holes for Connections of Work by Others: Provide all holes required for the connection of the Work of other Trades where noted on the Drawings, or determined prior to fabrication of the steel.

F. Finished Work: Any Work not presenting a finished appearance will be rejected. Furnish all members true to length so assembling may be done without fillers, except where required as detailed. Trim projecting edges or corners flush where different members are assembled. All items shall be free from twists, bends, and joints. Cope, block, and miter joints carefully and neatly. Clip projecting corners. Trim all filler pieces flush.

2.03 PAINTING (SHOP AND FIELD)

A. Miscellaneous (steel) metal shall be shop prime painted and field touched-up using paint specified herein.

B. Before shop painting, thoroughly clean all surfaces of all dirt, grease, scale and rust. All surfaces not in contact but inaccessible after assembling shall have two (2) coats before assembling. Surfaces in contact after assembling need have no paint. All finished pieces shall have one (1) coat before leaving the shop.

C. After erection, clean all foreign material off the steel, and if paint is removed, repaint to meet requirements of original prime coatings.

D. After all miscellaneous (steel) metal Work has been installed and accepted, touch-up all abraded surfaces, including field bolts and welded areas.

1. Volatile Organic Compounds (VOC) Content: Field touch-up paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

E. Furnish the General Contractor with copies of invoice for paint, and allow manufacturer's representatives and General Contractor full access to the paint shop to inspect the paint.

2.04 ANCHORS

A. Provide anchors for miscellaneous iron members anchored into concrete or masonry. Fabricate anchors from strap iron, bent to shape, welded to backs of members, extended with bent end for building-in as conditions require, of sizes and spacing as noted. Where size and spacing are not noted, furnish 1-1/2" x 1/4" size anchors for concrete and 1-1/2" x 1/8" size anchors for masonry. Space masonry anchors properly to fit the pointing of the adjacent masonry Work. Unless otherwise noted on the Drawings, space anchors 3'-0" or less on centers.

B. Where anchors and plates or clips are to be built-in for attachment of later Work, provide bolts in the plates or clips, welded to back, with threaded ends extended as required.

C. For attaching Work to masonry or concrete, where anchors or inserts cannot be built-in, provide approved type of cinch anchors and machine bolts or screws.

2.05 ANCHOR BOLTS AND PIPE SLEEVES

A. Furnish to Masonry Contractor for installation, miscellaneous anchor bolts and pipe sleeves as indicated and required, including all markings, setting diagrams, templates. Steel Contractor shall drill all holes required for anchor bolts and through-bolts detailed not to be built-in.

B. Furnish to Concrete Contractor for installation, pipe sleeves as indicated and required, including all markings, setting diagrams, and templates.

2.06 LINTELS

A. Furnish to the Masonry Contractor for setting, all steel lintels for masonry veneers, including those required for items such as grilles, doors, ducts, wall recesses and other locations shown or required.

B. Lintels shall be rolled structural shapes of sizes noted, selected for straightness and trueness of section. Camber shall not exceedM1/8" in 10'-0".

C. Unless otherwise shown, lintels shall have a bearing of not less than 8" each side of opening.

D. Galvanize all lintels in exterior walls.

2.07 MISCELLANEOUS STEEL FRAMES AND CURBS

A. General: Furnish steel frames and curbs in accordance with the Drawings and as specified herein, to Masonry or Concrete Contractor for setting.

B. Fabrication: Steel frames for door and other miscellaneous openings, and steel curbs throughout shall be built-up of rolled steel plate or structural sections as noted, with connections to adjoining Work, and anchors for building into masonry and/or concrete. All sections shall be selected for trueness of web and flange, straightened as required so that the finished frames are uniform, square and true throughout the length and depth of the assembled units and that curbs are straight and true.

C. Assembly: Frames shall be assembled by riveting or welding, but rivets may not be used on exposed surfaces. Built-up members of frames shall be connected by means of plug welding or continuous welding. Exposed edges of member shall be welded continuously. Frames and lintel members shall be welded together where so noted and shown. All exposed welding shall be ground smooth.

D. Door Frame Jambs in Concrete or Masonry: Provide 1-1/4" x 3/16" steel strap anchors on back, vertically adjusted, 2'-0" on centers maximum for building into concrete or masonry, and clip angle at bottom for bolting into concrete; and shall be fitted with temporary spreader bars at bottom to hold frame in shape during shipping and erection.

E. Steel Frames and Curbs in Concrete Work: Provide 1-1/2" x 1/4" steel strap anchors on back, extended for building-in, spaced not over 3 ft. on centers, but not less than two (2) per side.

2.08 STEEL LADDERS

A. General: Interior steel ladders, shall be Occupational Safety and Health Administration (OSHA) approved ladders complete as detailed on Drawings. Fabricate steel ladders, as detailed with parallel side rails, of structural steel shapes indicated, and 3/4" diameter, solid, cold-rolled steel bar stock rungs spaced as shown on Drawings. Drill side rails for rungs, set rungs into rails, weld rungs solidly into rails, and grind rails smooth. Provide all steel plate brackets, washers, and fasteners, including steel angle braces, as required and detailed to install ladders in place securely.

1. Recycled Content of Steel Products: Provide products with an recycled content of steel so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

2.09 MISCELLANEOUS

A. Anchoring Cements: Products specified herein shall be as manufactured by CGM, Incorporated, 1445 Ford Road, Bensalem, PA 19020, (800)523-6570, (215)638-4400;

www.cgmbuildingproducts.com, or comparable equivalent products subject to review by the Architect.

1. Exterior Use - Anchoring Cement: Super Por-Rok® Exterior Anchoring Cement, quality controlled hydraulic cement, quick-setting, pourable, non-metallic, non-shrink grout, in accordance with the following ASTM International Standard Specifications.

    a. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

    b. ASTM C900 - Standard Test Method for Pullout Strength of Hardened Concrete.

2. Interior Use - Anchoring Cement: Por-Rok® Anchoring Cement, non-shrink, hydraulic controlled expansion cement.

3. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

B. Isolation Coatings: Paint products specified herein shall be as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194, (800)474-3794, or comparable manufacturer's equivalent products subject to review by the Architect.

1. Aluminum Contact with Steel: Wherever aluminum items are to be secured to, or in contact with steel supporting members, paint the contact surface of the steel with the following paint system for both the surfaces of the steel supporting members and the aluminum.

    a. One (1) Prime Coat: Kem Kromik® Universal Metal Primer, B50WZ1 Off-White (VOC content of less than 420 grams/liter).

        1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

    b. One (1) Topcoat: TarGuard® Coal Tar Epoxy, B69B60 Black (VOC content of less than 250 grams/liter).

        1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Aluminum Contact with Masonry or Concrete: Wherever aluminum items are to be secured to or in contact with masonry or concrete, shop paint the aluminum contact surface with the following paint product.

    a. One (1) Topcoat: TarGuard® Coal Tar Epoxy, B69B60 Black (VOC content of less than 250 grams/liter).

        1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

3. Brass or Bronze Contact With Steel: Wherever brass or bronze items are to be in contact with steel members, paint the contact surfaces of the steel with one (1) coat of TarGuard® Coal Tar Epoxy, B69B60 Black, (VOC content of less than 250 grams/liter).

    a. Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

4. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel, aluminum, brass and/or bronze products. Exposed to view surfaces shall be clean and free of isolation coatings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 SETTING AND ERECTING MISCELLANEOUS METAL

A. Fabricate all items as required to be built into concrete or masonry completely, and deliver to site for installation by others. Furnish all parts complete with bolts, anchors, clips, ready to set. Deliver items to the general location of the Work. Where Work is composed of several parts, only those parts upon which anchors occur, will be set and built-in by the other Trades, ready to receive further field assembly by this Trade.

1. All Work required to be anchored entirely in concrete shall be set by the Concrete Contractor.

2. All Work required to be anchored entirely to masonry shall be set by the Mason Contractor.

3. All Work required to be anchored partially to masonry shall be set by the Mason Contractor.

B. Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, lay-out and install connections, install the Work and bolt up. Drill holes in Concrete and Masonry Work with rotary twist drills only.

C. Furnish, connect, and completely install all other items. Erect all items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Secure all parts in a rigid and substantial manner using concealed connections whenever practicable.

3.03 FIRE PREVENTION

A. Precautions: When welding or cutting with burning torches is required, take all precautions to prevent damage to the building(s) from fire, weld spatter, dripping molten metal, smoke and fumes, or other causes arising from the operations. Provide fireproof tarpaulins or enclosures around the areas of welding or burning.

B. Trained Personnel and Equipment: Furnish a worker trained and experienced in fire-fighting, whose sole duty shall be to prevent damage and fire at each location where welding or burning is to be done. Furnish adequate and sufficient fire-fighting equipment and extinguishers at each location.

3.04 FIELD FINISH PAINTING

A. Finish field painting of miscellaneous metal items as indicated on the Drawings and specified herein shall be by the Painting Contractor.

3.05 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, and services necessary for Rough Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Wood Nailers, Blocking, and Plywood - furnish and install.

2. Rough Hardware - furnish and install.

B. Related Sections: The following items of related Work will be performed under other sections of the Specifications:

1. Indoor Air Quality Requirements - Section 01 81 19. AIR BORNE PRODUCTS

2. Concrete Formwork and Cast-In-Place Concrete- Sections 03 10 0 and 03 30 00.

3. Unit Structural Masonry - Section 04 23 0.

4. Structural Steel - Section 05 12 00.

5. Metal Roof Deck - Section 05 31 0.

6. Cold-Formed Metal Framing - Section 05 40 00.

7. Board Insulation - Section 07 21 2.

8. Sheet Metal Work - Section 07 60 00.

9. Aluminum Framed Entrances and Storefronts- Section 08 41 13.

10. Gypsum Wallboard - Section 09 29 00.

11. Thin-Set Tile Work - Section 09 31 00.

12. Resilient Tile Flooring - Section 09 65 19

13. Paints and Coatings - Sections 09 90 00.

14. Toilet Compartments - Section 10 21 13.

15. Plumbing Fixtures - Division 22.

1.02 QUALITY ASSURANCE

A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.

B. Requirements of Regulatory Agencies:

1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.

C. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

D. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.03 MEASUREMENTS

A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building.

1.04 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products. Special attention shall be given to, but not necessarily limited to the following:

D. Product Data: Include the following for review.

1. Wood Treatment Certificates for Lumber and Plywood.

2. Products specified herein under Article heading MISCELLANEOUS".

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR ROUGH CARPENTRY

A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

B. Lumber: Wood shall conform to American Softwood Lumber Standard, current edition of "Voluntary Product Standard PS20", as published by the National Institute for Standards and Technology (NIST). Grades shall conform with current grading rules of the Lumber Manufacturers Association, under whose rules the lumber is manufactured.

C. Dimension and Board Lumber: Douglas Fir. All lumber shall be "seasoned dry" (S-DRY), 19% or less moisture content.

D. Lumber Grades:

1. Boards: Douglas Fir, S4S, Standard Grade or better.

E. Wood Treatments: All dimension lumber except wood blocking and nailers at roof, shall be fire retardant treated. Wood blocking and nailers at roof and in contact with masonry shall be preservative treated.

2.02 PLYWOOD

A. Standards, Thicknesses and Grades: Plywood shall be in accordance with the National Institute of Standards and Technology (NIST) current DOC VPS Standard PS 1-95, and the quality standards of the APA-The Engineered Wood Association (formerly American Plywood Association). Thicknesses shall be as indicated on the Drawings. Grades of plywood shall be as follows for various uses, as indicated by the registered grade-trademarks of APA:

1. Plywood Sheathing: C-D EXT-APA or APA Standard with exterior glue.

2. A-C Plywood: A-C EXT-APA.

3. A-D Plywood: A-D Exposure 1 (interior exposed, such as backboards for electrical and telephone panels).

4. B-C Plywood: B-C EXT-APA (water heater platforms).

5. C-D Plywood: C-D Plugged (interior concealed).

B. Engineered Wood Products: Products shall contain no urea formaldehyde.

C. Fire Retardant Treatment: All plywood and plywood sheathing shall receive “Fire Retardant Treatment” as specified herein.

2.03 WOOD TREATMENTS

A. Manufacturer: Wood treatments required and as specified herein shall be products Equal to: Arch Wood Protection, Inc., Arch Treatment Technologies, Inc., 5660 New Northside Drive, Suite 1100, Atlanta, GA 30328, (678)627-2000; www.archchemicals.com. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.

B. Wood Preservative Treatment: All wood nailers at roof parapets, and/or in contact with masonry, and elsewhere as indicated on the Drawings, shall be pressure impregnated in accordance with the specifications for treatment by Arch Wood Protection, Inc., with Wolman® CCA (Chromated Copper Arsenate) wood preservative and shall bear the Wolmanized® trademark. Treated wood shall conform to AWPA Standard P5, and have a mark certifying conformance. The treating process shall meet requirements of Fed. Spec. TT-W-571 and AWPA Commodity Standards as applicable.

C. Fire Retardant Treatment: Fire retardant treat all wood lumber, plywood and plywood sheathing by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer's U.L. approved, specifications, and shall render the wood fire retardant to the extent that
the flame spread does not exceed 25 per ASTM Standard E84 modified to require a 30 minute test period. The treating process shall conform to the requirements of the applicable AWPA Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWPA P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

D. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.

E. Exposed Wood/Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

1. Volatile Organic Compounds (VOC) Content: Field applied preservative and fire-retardant product specified herein shall have a VOC content of 350 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2.04 ROUGH HARDWARE

A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.

B. Bolts, Nuts, and Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.

C. Nails: Use nails conforming with Federal Spec. FF-N-105a, except as otherwise specified. Use galvanized steel nails for all Work. Zinc coating on galvanized nails shall conform with Article 3.2.1 of the Fed. Spec. Do not use aluminum nails. Except as otherwise specified, use common nails for securing of rough carpentry, use casing or finish nails, counter-set, for securing of finish carpentry.

D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested in accordance with Fed. Spec. MIL-L-19140E, Paragraph 4.6.5.2.

2.05 MISCELLANEOUS

A. Isolation Coatings: Paint product specified herein shall be as manufactured by The Sherwin Williams® Company, McAllen, TX, or comparable manufacturer's products subject to review by the Architect.

1. Paint Product: TarGuard™ Coal Tar Epoxy, B69B60 Black.

2. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel/metal products. Exposed to view surfaces shall be clean and free of isolation coatings.

3. Volatile Organic Compounds (VOC) Content: Field applied preservative and fire-retardant product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 - Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 ROUGH CARPENTRY

A. Wood Nailers, and Blocking:

1. Neatly and accurately fit together with all necessary bolts and spikes, all wood where indicated on Drawings, such as blocking, nailers, as required to make secure.

2. Where wood blocking is required in metal stud framed walls, e.g., for support of Tenant's or Owner's fixturing, securely fasten the wood blocking to the metal stud framing at positions required, as detailed and/or noted on the Drawings. Coordinate Work with Tenant's or Owner's Representative.

3. Where wood members are to be secured to masonry, secure with 1/2" bolts with 3" hooked ends, not less that two (2) to each block, continuous nailers shall be spaced approximately 32" O.C. Bore lumber for bolts and countersink for heads. Provide washers under all bolt heads and nuts. All nailers and cants shall be furnished in long lengths to minimize number of end joints. When joints are required, they shall be made without projecting edges.

4. Miscellaneous wood items which are built into concrete or masonry shall be delivered to the respective contractors for installation.

5. Metal roof deck flutes shall be provided with wood blocking where and as indicated on the Drawings.

B. Rough Hardware: Install all items of rough hardware as necessary for the execution of the Work.

C. Preservative Treated Wood: Install wood treated with approved preservative for wood nailers at roof parapets, and in contact with masonry. Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative as applied at the treatment plant.

D. Fire Retardant Treated Wood: Install wood that has been fire retardant treated, and in all wood blocking.

E. Plywood: Install plywood, including plywood sheathing, of thickness noted and where indicated on Drawings. All Work and nailing shall be in accordance with the recommendations of APA-The Engineered Wood Association, and with the governing code requirements.

3.03 CLEAN-UP

A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.

B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 06 11 40
WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes roof curbs, and perimeter nailers; blocking in roof openings; telephone and electrical panel back boards; and preservative treatment of wood.

B. Related Sections:

1. Section 05312: Metal roof decking to receive wood curbs.

1.2 REFERENCES

A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.

B. APA/EWA (APA/Engineered Wood Association) - Certification.

C. AWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

D. SPIB (Southern Pine Inspection Bureau) - Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data on wood preservative and fire retardant treatment materials and provide application instructions where required.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA/EWA.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: SPIB.

B. Miscellaneous Framing: Stress Group D, No. 2 or better grade 19 percent maximum moisture content after treatment, pressure preservative treat.

C. Plywood: APA/EWA Rated Sheathing, Grade C-D; Exposure Durability 1; unsanded.

2.2 ACCESSORIES

A. Fasteners and Anchors:
1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

PART 3 EXECUTION

3.1 FRAMING

A. Set members level and plumb, in correct position.

B. Place horizontal members, crown side up.

C. Construct curb members of solid wood sections.

D. Space framing and furring 16 inches oc.

E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

F. Coordinate curb installation with installation of decking and support of deck openings.

3.2 SHEATHING

A. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches beyond size of electrical and telephone panel.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment.

B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.4 SCHEDULES

A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

B. Telephone and Electrical Panel Boards: ¾ inch thick, square edges, site brush applied preservative treated.

C. Storefront Blocking and shim: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

END OF SECTION

SECTION 06 16 43
GYPSUM SHEATHING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications

PART1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Section 05 40 00 Cold-Formed Metal Framing.

2. Section 06 10 00 Rough Carpentry.

3. Section 09 21 16 Gypsum Board Assemblies.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.

2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers**.**

8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.03 QUALITY ASSURANCE

A. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

B. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.04 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.05 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).

B. Manufacturer's Warranty:

1. Five years against manufacturing defects.

2. Ten years against manufacturing defects when used as a substrate in architecturally specified EIFS.

1.06 MATERIAL DELIVERY, STORAGE & HANDLING

A. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART2 PRODUCTS

2.01 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:

1. Fiberglass-Mat Faced Gypsum Sheathing, Type X for Fire Rated Designs: DensGlass Fireguard Sheathing.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MATERIALS

A. Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177, Type X:

1. Thickness: 5/8 inch.

2. Width: 4 feet.

3. Length: [8 feet] [9 feet] [10 feet].

4. Weight: 2.5 lb/sq. ft.

5. Edges: Square.

6. Surfacing: Fiberglass mat on face, back, and long edges.

7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.

8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.

9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.

10. Permeance (ASTM E96): Not more than 17 perms.

11. R-Value (ASTM C518): 0.67.

12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.

13. Microbial Resistance (ASTM D6329, GREENGUARD 3-week protocol): Will not support microbial growth.

14. Acceptable Products:

a. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum.

2.03 ACCESSORIES

A. Screws: ASTM C1002, corrosion resistant treated.

PART3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

C. Verification of Conditions:

1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.02 INSTALLATION

A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.

1. Manufacturer's Recommendations:

a. Current "Product Catalog", Georgia-Pacific Gypsum.

3.03 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

3.04 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, and services necessary for Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Counter Supports - furnish and install.

2. Hollow Metal Door and Frames - install.

3. Finish Hardware - install.

4. TV Wall Mount Bracket - install.

B. Color Selections: Refer to Color Legend on Drawings.

C. Door Schedule and Colors: Refer to the Drawings.

D. Related Sections: The following items of related Work will be performed under other sections of the Specifications:

1. Unit Structural Masonry - Section 04 23 0.

2. Rough Carpentry - Section 06 10 00.

3. Hollow Metal Doors and Frames - Section 08 11 13.

4. Aluminum Framed Entrances and Storefronts - Section 08 41 13.

5. Door Hardware - Section 08 71 00.

6. Gypsum Wallboard - Section 09 29 00.

7. Thin-set Tile Work - Section 09 31 00.

8. Paints and Coatings - Section 09 90 00.

9. Toilet Compartments - Section 10 21 13.

10. Signage - Section 10 14 00.

11. Toilet Accessories - Section 10 28 13.

12. Fire Protection Specialties - Section 10 44 00.

13. Miscellaneous Accessories - Section 10 80 00.

14. Plastic Laminate - Clad Countertops - Section 12 36 23.13.

15. Plumbing Fixtures - Division 22.

1.02 QUALITY ASSURANCE

A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.

B. Requirements of Regulatory Agencies:

1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.

1.03 MEASUREMENTS

A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building.

1.04 SUBMITTALS

A. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products. Special attention shall be given to, but not necessarily limited to the following:

1. Counter Supports.

B. Product Data: Include the following for review.

1. Wood Treatment Certificates for Lumber and Plywood.

2. Products specified herein under Article heading “MISCELLANEOUS”.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

B. Finish Hardware: The Finish Hardware Contractor will furnish all finish hardware not included in other trades, and deliver to Carpenter for storage and installation. Carpentry Contractor shall be responsible for safekeeping, furnishing templates to proper contractors, proper installation, receiving shipments and delivery of keys for hardware.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR FINISH CARPENTRY

A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

B. Lumber Grades: All lumber shall conform to, and be graded in accordance with American Lumber Standard PS-20.

1. Grading Authority Stamp: All lumber shall bear stamp of grading authority indicating compliance with specified species, grade and moisture content. Finish lumber shall be stamped on back or end where not exposed to view.

2. Dimension and Board Lumber: Douglas Fir or Pine. Maximum allowable moisture content shall be 12%.

a. Appearance Framing: 2" to 4" thick, 2" and wider shall be Douglas Fir, S4S, No. 1/Appearance.
b. Boards: 1" thick, 2" and wider shall be Douglas Fir or Pine, S4S, Superior or better.

C. Millwork and Trim: “Custom Grade” as defined in the Architectural Woodwork Quality Standards Guide Specifications, and Quality Certification Standards of the Architectural Woodwork Institute (AWI).

D. Wood Species: Unless otherwise noted on the Drawings, wood specie shall be as follows (Provide sample for approval):

1. Paint Grade Trim: Natural Birch or Poplar.

2. Stain Grade Trim: Red Oak.

3. Hardwood: Natural Birch or Poplar.

E. Engineered Wood Products: Products shall contain no urea formaldehyde.

2.02 WOOD TREATMENTS

A. Manufacturer: Wood treatments required and as specified herein shall be products Equal to: Arch Wood Protection, Inc., 1955 Lake Park Drive, Suite 100, Smyrna, GA 30080, (770) 801-6600 or (866) 873-3789. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.

B. Wood Preservative Treatment: All wood nailers at roof parapets, and/or in contact with masonry, and elsewhere as indicated on the Drawings, shall be pressure impregnated in accordance with the specifications for treatment by Arch Wood Protection, Inc., with Wolman® CCA (Chromated Copper Arsenate) wood preservative and shall bear the Wolmanized® trademark. Treated wood shall conform to AWPA Standard P5, and have a mark certifying conformance. The treating process shall meet requirements of Fed. Spec. TT-W-571 and AWPA Commodity Standards as applicable.

C. Fire Retardant Treatment: Fire retardant treat all wood framing, plywood and plywood sheathing by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer’s U.L. approved, specifications, and shall render the wood fire retardant to the extent that the flame spread does not exceed 25 per ASTM Standard E84 modified to require a 30 minute test period. The treating process shall conform to the requirements of the applicable AWPA Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWPA P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

D. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.

E. Exposed Wood/ Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

2.03 ROUGH HARDWARE

A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.

B. Bolts, Nuts, and Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.

C. Nails: Use galvanized steel nails for all Work. Do not use aluminum nails. Except as otherwise specified, use common nails for securing of rough carpentry, use casing or finish nails, counter-set, for securing of finish carpentry.

D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested.

2.04 MISCELLANEOUS

A. General: Miscellaneous materials specified herein represent products from the McMaster-Carr Supply Company, P.O. Box 94930, Cleveland, OH 44101-4930, (330)995-5500, and illustrate the type, material, quality, required. Comparable products may be acceptable, subject to the Architect’s review.

1. Fastening Hardware: Provide materials such as screws, bolts, nuts, washers, nails, anchors, and miscellaneous other fastening products as required by the Drawings and/or field conditions.

B. Counter Supports:

1. Support bracket to be fully recessed 2" x 2" x 0.25" aluminum “T” extrusion, 12" x 14", as manufactured Equal to: Rangine Corp., 330 Reservoir Street, Needham, MA 02494, (800)826-6006, www.rakks.com.

2. Support angle to be 1-1/4" x 1-1/4" x 3/16" aluminum angle as supplied Equal to: McMaster-Carr Supply Co., P.O. Box 94930, Cleveland, OH 44101, (330)995-5500, www.mcmaster.com.

C. TV Wall Mount Bracket: Provide TV Mounting Bracket Anchor Kit, Part PAC-115, as recommended by Bracket Manufacturer. Bracket Manufacturer is Equal to: Chief Manufacturing. Anchor kit can be purchased online through www.Amazon.com or www.Clubmac.com.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 FINISH CARPENTRY WORK

A. General:

1. All Finish Carpentry Work shall be executed by skilled mechanics in a workmanlike manner. All joints shall be neatly and accurately made, closely fitted and assembled to remain tight and conceal any shrinkage.

2. All wood shall be well sanded to perfectly smooth surfaces, touched-up by hand and made suitable to receive paint or stain finish Work by Painting Contractor.

3. Protect all wood finishes from damage due to traffic or other construction Work, by covering with building paper and boards. Protection shall be particularly required for the jambs of openings through which material is being transported.

B. Finish Hardware: All finish hardware for wood doors and for hollow metal doors will be furnished by the Finish Hardware Contractor to Carpentry Contractor for installation. Prepare all doors to receive the hardware. Install and adjust all hardware properly, in accordance with the manufacturer's instructions. Attach and secure the hardware so that no parts are damaged or injured. Install weather stripping, door sweeps, and overhead rain drip at exterior doors.

C. Architectural Millwork: Install at locations indicated on the Drawings, all wood products as specified herein.

D. Corner Guards:

1. Project Conditions and Temperature: Materials must be acclimated in an enclosed environment of 65°-75°F for at least 24 hours prior to beginning the installation. Temperature at the time of installation must be between 65°-75°F and be maintained for at least 48 hours after the installation.

2. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3. Surface Preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.

4. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

5. Installation: Install and clean corner guards in strict accordance with the manufacturer's installation and cleaning method recommendations. Use only contact cement recommended by manufacturer, and locate all components firmly into position, level and plumb.

3.03 CLEAN-UP

A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.

B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 07 19 00
WATER REPELLENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes water repellent coating applied to exterior clay brick, and concrete surfaces.

B. Related Sections:
1. Section 04230-Reinforced Unit Masonry
2. Section 07900 - Joint Sealers.

1.2 REFERENCES

A. ASTM D1653 - Test Method for Water Vapor Transmission of Organic Coating Films.

1.3 SYSTEM DESCRIPTION

A. Applied Penetrant: Material to restrict moisture absorption in material being treated as recommended by manufacturer for specific substrate.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit details of product description, tests performed, limitations to coating, and chemical properties including percentage of solids.

C. Manufacturer's Installation Instructions: Submit special procedures and conditions requiring special attention, and cautionary procedures required during application.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the Work of this section with minimum three years documented experience approved by manufacturer.

1.6 MOCK-UP

A. Section 01400 - Quality Requirements: Mock-up requirements.

B. Prepare one full panel surface in size.

C. Prepare one brick column base surface in size, in accordance with ASTM D5703.

D. Locate where directed.

E. Testing: Test mock-up with 5/8 inch garden hose with spray nozzle located approximately 10 feet from wall and aimed upward so water strikes at 45 degree downward angle.
   1. Do not begin testing until mock-up has fully cured, minimum 20 days unless longer period recommended by manufacturer.
   2. Run water continuously for minimum three hours and observe back side of mock-up for water penetration and leakage.
   3. If leakage is detected make changes as needed and retest; retest until no leakage is detected.

F. Mock-up may not remain as part of the Work.

1.7 PRE-INSTALLATION MEETING

A. Section 01 30 00 - Administrative Requirement: Pre-installation meeting.
B. Convene minimum one week prior to commencing mock-up for this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect coating liquid from freezing.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements.

B. Do not apply coating when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

C. Do not apply coating when wind velocity exceeds manufacturer recommendations.

1.10 WARRANTY

A. Section 01 70 00 - Execution Requirements: Product warranties and product bonds.

B. Provide five-year manufacturer warranty for water repellents.

PART 2 PRODUCTS

2.1 WATER REPELLENTS

A. Manufacturers:

1. Huls, Chem-Tret PB VOC
2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Silane Water Repellent: Silane penetrating type water repellent, containing 40 percent solids by weight, with maximum 1.44 lb/gal (400 g/L) VOC content.

B. Moisture Vapor Transmission: Maximum 28.33 perms or 50% compared to untreated surfaces, ASTM D1653.

C. Resistance to Accelerated Weathering: No loss in repellency after 2,500 hours, ASTM G53.

D. Reduction of Leakage: Minimum 97 percent water penetration and leakage, ASTM E514.

E. Apply to Tilt-Up Pre-cast Concrete Panels.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.

3.2 PREPARATION

A. Delay Work until concrete substrate is cured a minimum of 60 days.

B. Remove loose particles and foreign matter.

C. Remove oil or foreign substance with a chemical solvent, which will not affect coating.

D. Scrub and rinse surfaces with water and let dry.

3.3 APPLICATION

A. Apply coating in accordance with manufacturer’s instructions.

B. Apply in two continuous, uniform coats.

3.4 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 – Project Closeout: Protecting installed construction.

B. Protect adjacent surfaces not scheduled to receive coating.

C. Protect landscaping, property, vehicles.

D. If applied to unscheduled surfaces, remove immediately by methods as instructed by coating manufacturer.

END OF SECTION

SECTION 07191
VAPOR RETARDANT

1.1 SCOPE

A. The Conditions of The Contract (Division 0), and General Requirements (Division 1), are applicable to and a part of this Section.

B. Related Work Specified Elsewhere:

1. Termite Treatment: Section 02281.

1.2 DESCRIPTION

A. Vapor Barrier (Under Slab): Shall conform to ASTM E1745, Class C or better and shall have a minimum water vapor permeance of .044 perms when tested in accordance with ASTM E96. Vapor barrier shall be no less than 15 mils thick.

PART 2: PRODUCTS

2.1 APPROVED PRODUCTS

A. Stego Wrap (15 mil).by Stego Industies LLC. (887) 464-7834.

B. Griffolyn T-65 by Reef Industries (800) 231-6074.

C. Rufco D16WB by Raven Ind. At Texas Environmental Plastic: (281) 821-7320.

PART 3: EXECUTION

3.1 INSTALLATION

A. Lay sheets smoothly, stretch and weight edges, lap joints twelve (12) inches and seal with tape as specified by vapor barrier manufacturer. Turn barrier up six 6 inches at walls and at all pipes, abutments, etc. Tape and seal at penetrations and at edges.

B. At grade beams, extend vapor barrier down sides of beam trenches (and footing excavations).

3.2 PATCHING:

A. Patch all punctures with a minimum overlap of 6” in all directions and tape around entire perimeter of repair.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, and services necessary for Insulation Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Furnish and Install:

a. Blanket/Batt Insulation.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Concrete Work - Section 03 30 00.

2. Masonry - Section 04 20 00.

3. Steel Roof Decking - Section 05 31 23.

4. Cold-Formed Metal Framing - Section 05 40 00.

5. Rough Carpentry - Section 06 10 00.

6. Sheet Metal Work - Section 07 60 00.

7. Joint Protection - Section 07 90 00.

8. Aluminum Window Framing - Section 08 41 00.

9. Gypsum Sheathing Panels and Gypsum Wallboard - Section 09 29 00.

1.02 QUALITY ASSURANCE

A. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.03 SUBMITTALS

A. Product Data: Submit three (3) sets of manufacturer's Product Data for each type of insulation specified herein.

1.04 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.

C. Waste Management: Collect field generated construction waste created during construction or final.

1.05 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding and ladders in accordance with applicable code requirements. Erect at times and locations so as not to delay any part of the Work, and promptly remove when no longer required.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 BLANKET/BATT INSULATION

A. Manufacturer: Insulation specified herein shall be as manufactured by Thermafiber, Inc., 3711 Mill Street, Wabash, IN 46992, (888)834-2371 or (260)563-2111; www.thermafiber.com.

1. Insulation: Commercial quality, inorganic and noncombustible Thermafiber® Fire Safety Blankets, open-faced with vapor barrier (foil-faced vapor retarder), unless otherwise noted on the Drawings, flame-resistant, mineral wool fiber insulation.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

C. Blanket/Batt Widths: Provide as required by framing member spacings indicated on Drawings.

D. Surface Burning Characteristics: Class A fire hazard classification in accordance with ASTM Standard E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1. With Vapor Barrier: Thermafiber® FS-25 (with foil-faced vapor retarder attached), Type III, Flame Spread maximum 25, and Smoke Developed 0.

2. Without Vapor Barrier: Thermafiber® FS-15 (unfaced), Type I, Flame Spread 0, and Smoke Developed 0.

E. Vapor Retarder Facing: Foil-scrim (FSP) laminate vapor retarder shall be applied with a flameresistant adhesive. Class A flame-spread rating. Vapor retarder facing, shall have 0.02 perm rating, or better, when tested in accordance with ASTM Standard E96, Procedure A.

F. Type and Quality: Rated non-combustible as defined by National Fire Protection Association NFPA Standard 220, when tested in accordance with ASTM Standard E136. Insulation shall be nonasbestos, moisture-resistant, noncorrosive, nondeteriorating, mildew-proof and vermin-proof.

G. Thermal Resistance Values: Provide not less than R19 as unless otherwise indicated on Drawings. Thicknesses shall be as determined by manufacturer for “R” value specified. More than one layer of insulation may be used to achieve the specified “R” value.

H. Vapor Retarder Tape: Compatible with specified facer and comparable perm rating. For taping insulation joints and repairing tears.

I. Exposed Insulation: Where exposed, insulation shall meet the requirements of Factory Mutual (FM).

PART 3 - EXECUTION

3.01 BLANKET/BATT INSULATION INSTALLATION

A. General: Install blanket/batt insulation at metal stud framed exterior building walls, and other locations as indicated on Drawings.

1. Install insulation between studs, from interior side of wall recessed slightly from stud faces. Secure to studs to prevent sagging, in accordance with manufacturer's recommendations.

2. Fill voids in building construction with blanket insulation, at locations indicated on the Drawings, such as between top of concrete walls and underside of metal deck; between top of structural steel members and underside of deck, between exterior face of structural steel member and exterior construction.

3. Foil-faced batt insulation shall be furnished to the Sheet Metal Contractor for utility enclosures.

B. Vapor Retarder Installation: Seal all joints in exterior wall insulation with vapor retarder tape. Apply vapor retarder tape at intersection of insulation with framing, adjacent pieces and similar intersections to insure a vapor tight seal. Repair all tears in insulation foil facing with vapor retarder tape.

3.02 EXAMINATION

A. Refer to Section 01 31 00 - Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.03 CLEAN-UP

A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.

B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General

Contractor, or if directed by the General Contractor to remove from the site and legally dispose.

C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

D. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 07 21 20
BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes board insulation above metal deck.

B. Related Sections:
1. Section 07260 - Vapor Retarders: Vapor retarder materials to adjacent insulation.

1.2 REFERENCES

A. ASTM C1177 – Values for Sheathing.

B. ASTM C79- Values for paper faced gypsum sheathing.

C. Gypsum Association-GA252.

D. ASTM C240 - Testing Cellular Glass Insulation Block.

E. ASTM C552 - Cellular Glass Thermal Insulation.

F. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.

G. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation Board.

H. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

J. NFPA 255 (National Fire Protection Association) - Test of Surface Burning Characteristics of Building Materials.

K. UL 723 (Underwriters Laboratories, Inc.) - Tests for Surface Burning Characteristics of Building Materials.

L. ASTM C510 – Test Methods for heat flow meter.

1.3 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.

B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07260.

C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria, limitations, adhesives and warranties.

C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, and installation techniques.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements.

B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

1.6 SEQUENCING

A. Section 01100 - Summary: Work sequence.

B. Sequence Work to ensure firestopping, vapor retarder, and air barrier materials are in place before beginning Work of this section.

1.7 COORDINATION

A. Coordinate Work with Section 07260 for installation of vapor retarder and Section 07270 for air seal materials.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Manufacturers:

1. Rigid Board Insulation Compatible with TPO roof. Comply with R-value requirements as stated on the drawings.

2. Substitutions: Section 01600 - Product Requirements Not Permitted.

2.2 ACCESSORIES

A. Joint tape: 2” wide, 10x10 glass mesh tape.

B. Joint Compound: G-P Gypsum Corporation GyProc 90 setting type joint compound.

C. Nails, Wood Framing: Hot dip, 11-gauge galvanized nails with 7/16” head, 1 ½” min. length.

D. Screws, metal framing:

1. Type S-12, bugle head, self tapping, rust resistant, fine thread for heavy steel gauge(12 to 22).

2. Type S, bugle head, rust resistant sharp point, fine thread for light gauge metal framing or furring.

E. Screws, metal or wood framing:

1. Wafer head, rust resistant, Type S-12 drill or Hi Lo, min. 1 ¼ length. Or Type W rust- resistant, bugle head, coarse thread, sharp point for wood.

F. Sealant: Dow Corning 795 or equivalent.

G. Cellular Glass Insulation: [ASTM C552 Type IV,] cellular glass board; with the following characteristics.

1. Board Size: 4’x0” inch 8’x0”.

2. Board Thickness: ½ inches.

3. Thermal Resistance: R of 0.56.

4. Compressive Strength: Minimum 40 psi.

5. Water Absorption: In accordance with ASTM C240, 0.2 percent by volume maximum.

6. Facing: Factory applied No. 15 non-perforated asphalt saturated felt complying with ASTM D226, Type 1 or equal.

7. Board Edges: square.

8. Flame/Smoke Properties in accordance with ASTM E84, UL 723, NFPA 255.

9. Facing: [Unfaced] [Faced on one side with asphalt treated mesh reinforced Kraft paper] [Faced one side with mesh reinforced aluminum foil] [Faced one side with asphalt treated mesh reinforced Kraft paper and other side with mesh reinforced aluminum foil]

10. Board Edges, square.

11. Flame/Smoke Properties in accordance with ASTM E84, UL 723, NFPA 255.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances affecting adhesive bond.

D. Preparation: Examine subframing, verify that surface of framing and furring members to receive sheathing does not vary more than ¼ " from the place of faces of adjacent members.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Adhere 4 inch wide strip of polyethylene sheet over construction joints with double beads of Type 1 adhesive each side of joint.

1. Tape seal joints.

2. Extend sheet full height of joint.

B. Apply Type 1 adhesive in three continuous beads per board length to full bed 1/8 inch thick.

C. Install boards on foundation wall, grade beam perimeter, vertically horizontally.

1. Place boards in method to maximize contact bedding.

2. Stagger [side] [end] joints.

3. Butt edges and ends tight to adjacent board and to protrusions.

D. Extend boards over control and unbonded to foundation on one side of joint.

E. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

F. Sheathing: Provide Dens-Glass Gold sheathing where indicated on drawings. Install sheathing in accordance with manufacturer's, instructions and applicable instructions in GA-253 and ASTM C 1280.

G. Install Dens-Glass Gold Sheathing with gold side out.

H. Use maximum lengths possible to minimize number of joints.

I. Wood Framing: Attach Dens-Glass Gold sheathing to wood framing with nails spaced 4" o.c. at perimeter for racking shear resistance, 8" o.c. at perimeter where there are framing supports and where racking shear resistance is not required; and 8" o.c. along intermediate framing in field for both conditions.

J. Metal Framing: Attach Dens-Glass Gold sheathing to metal framing with screws spaced 8" o.c. at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field.

K. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.

L. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.

M. Joint treatment and finish preparation:

1. Painted ceilings and soffits

a. Apply joint tape over joints and embed in setting type joint compound specified.

b. Skim coat surface with setting type joint compound for smooth finish.

c. Prime and paint with exterior grade, good quality paints.

N. Building paper: 1.If required install building paper or equal with flashing around openings.

3.3 INSTALLATION - EXTERIOR WALLS

A. Adhere 6 inch wide strip of polyethylene sheet over joint with double beads of Type 1 adhesive each side of joint.

1. Tape seal joints between sheets.

2. Extend sheet full height of joint.

B. Apply Type 1 adhesive in three continuous beads per board length to full bed 1/8 inch thick. Daub adhesive tight to protrusions.

C. Install boards on wall surface, studs, horizontally. Place membrane surface of insulation against adhesive.

D. Place boards in method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

E. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

F. Place 12 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and doors frame. Tape seal in place to ensure continuity of vapor retarder and air seal.

G. Tape insulation board joints.

3.4 SCHEDULES

A. Perimeter Insulation: Type B, extruded polystyrene, bead adhesive application, 1/2 inch (13 mm) thick protection board.

B. Cavity Wall Insulation: Type F, semi-rigid glass fiber board, full bed vapor retarder adhesive, secured with impaling fasteners.

END OF SECTION

SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, equipment, and materials to install rigid insulation, tapered insulation and ½" asphalt coated wood fiber over deck substrates indicated on the drawings. Install cants, crickets and saddles where indicated on drawings.

1.02 RELATED SECTIONS

A. Division 6 "Rough Carpentry"

B. Division 7 "Modified Bituminous Sheet Roofing"

1.03 SUBMITTALS

A. Samples and product literature for all products listed.

B. Design Loads: Submit copy of minimum design load calculations according to ASCE 7-10 for Components and Cladding. In no case shall the design loads be taken to be less than those detailed in article 1.06 of this specification.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened packages, dry, undamaged, seals and labels intact.

B. Store all insulation delivered to the site in enclosed trailers.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Apply insulation only when the weather conditions are in compliance with the roof system limitations.

B. Protect the installed insulation from water penetration at the end of each day's work.

C. Application of the roof system shall immediately follow the installation of the roof insulation as it is installed.

1.06 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity

1. Installed roof system over 22 ga. steel decks, shall withstand negative (uplift) design wind loading pressures complying with the structural drawings. Attachment shall be installed exactly as given in article 3.03.

a. Design Code: ASCE 7-10 for Components and Cladding.

Roof Area	**Design Uplift Pressure**
Zone 1 - Field of roof	- 27.5 psf
Zone 2 – Eaves and rakes	- 46.1 psf
Zone 3 - Corners	- 69.3 psf

Edge Zone width for 2 & 3 = 6 feet - 10 inches.

PART 2 - PRODUCTS

2.01 GENERAL

A. When a particular make or trade name is specified, it shall be indicative of a standard required.

2.02 MATERIALS

A. Polyisocyanurate Insulation Board: ASTM C 1289 Type II, Class 1, Grade 2,
1. 5-inch minimum, Average R-value, 20 LTTR. Provide in 4 ft. by 4 ft. sizes. ACFoam-II, Atlas Roofing Corporation.

B. 1/2” Wood fiber recovery board, asphalt impregnated all six sides.

C. USG Securock® Gypsum-Fiber Roof Board, 1/2-inch.

2.03 RELATED MATERIALS

A. As indicated on plans.

B. Fasteners & Plates:
1. Steel Deck: Trufast #14 HD fasteners with 3” steel plates, Altenloh, Brinck & Co. Group.

C. Tapered Crickets: 1/2” slope minimum, Polyisocyanurate Insulation Board: ASTM C 1289 Type II. ACFoam-II, Atlas Roofing Corporation.

D. Cant Strips: Fiberglass, Glass Cant. The Garland Company

E. Type IV Steep Asphalt.

PART 3 - EXECUTION
3.01 EXAMINATION

A. Examine substrate surfaces to receive roof and deck insulation and associated work and conditions under which insulation will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Verify deck and surfaces are clean, smooth, dry, free of depressions or irregularities prior to beginning installation of materials.

C. Verify roof openings, curbs, pipes, sleeves, ducts, penetrations or vents through roof are solidly set, wood nailing strips are in place.

D. Verify all specifications related to Carpentry, have been followed prior to beginning installation of insulation. Beginning installation means acceptance of substrate.

3.02 PROTECTION

A. During execution of work covered by this Section, the Contractor shall provide protection for roof insulation from water and wind penetration at the end of each day's work.

B. Protect the roof insulation in areas that will receive excessive traffic with a surface protection such as plywood.

C. All workmen shall wear clean, soft rubber-soled shoes for any application work where they may be walking on the in-place insulation.

3.03 GENERAL INSTALLATION

A. Insulation board shall be fully attached with specified fastening system as listed below.

1. STEEL DECKS

a. Fasteners in FIELD, Zone 1 of the roof are placed 12 fasteners per board.

b. Fasteners at PERIMETERS, Zone 2 of the roof are placed 18 fasteners per board.

c. Fasteners at CORNERS, Zone 3 of the roof are placed 24 fasteners per board.

d. Placement of any fastener from edge of insulation board shall be a minimum of three inches, and a maximum of six (6) inches.

e. Minimum penetration into deck shall be as recommended by the fastener manufacturer. There is a one (1) inch minimum for metal. .

B. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.

C. Install the ½" wood fiber board using Type IV Steep asphalt. Offset joints with those of the Insulation.

D. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of 1/4" away from the vertical surface.

E. Sump all roof insulation at all scuppers.

F. Cant Strips/Tapered Edge/Crickets: Install preformed 45-degree cant strips at junctures of vertical surface. Install crickets where indicated on the plans.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS
DuPont ™ Tyvek® CommercialWrap® D

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane - DuPont™ Tyvek® CommercialWrap® D

B. Seam Tape - DuPont™ Tyvek® Tape

C. Flashing - DuPont™ FlexWrap™, DuPont™ FlexWrap™ NF, DuPont™ StraightFlash™, DuPont™ StraightFlash™ VF, and DuPont™ Thru-Wall Flashing

D. Fasteners - DuPont™ Tyvek® Wrap Caps

1.2 REFERENCES

A. ASTM International

1. ASTM C 920; Standard Specification for Elastomeric Joint Sealants
2. ASTM C 1193; Standard Guide for Use of Joint Sealants
3. ASTM D 882; Test Method for Tensile Properties of Thin Plastic Sheeting
4. ASTM D 1117; Standard Guide for Evaluating Non-woven Fabrics
5. ASTM E 84; Test Method for Surface Burning Characteristics of Building Materials
6. ASTM E 96; Test Method for Water Vapor Transmission of Materials
7. ASTM E 1677; Specification for Air Retarder Material or System for Framed Building Walls
8. ASTM E2178; Test Method for Air Permeance of Building Materials
9. ASTM E2357; Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

B. AATCC – American Association of Textile Chemists & Colorists

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. TAPPI

1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
2. Test Method T-460; Air Resistance of Paper (Gurley Hill Method)

1.3 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

D. Quality Assurance Submittals

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

E. Closeout Submittals

1. Refer to Section 01 70 00 Project Closeout.
2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Installer shall have experience with installation of DuPont ™ Tyvek® weather barrier assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

B. Mock-up

1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.

   a. Mock-up size: 8 feet by 8 feet.
   b. Mock-up Substrate: Match wall assembly construction, including window opening.
   c. Mock-up may remain as part of the work.

2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting

1. Refer to Section 01 31 00 Project management and Coordination.
2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and weather barrier manufacturer's designated representative.
3. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 Product Requirements.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.7 WARRANTY

A. Special Warranty

1. Weather barrier manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase.
2. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. DuPont; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1-800-44-TYVEK (8-9835); http://www.construction.tyvek.com

2.2 MATERIALS

A. Basis of Design: High-performance, spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.

B. Performance Characteristics:

1. Air Penetration: 0.001 cfm/ft^2 at 75 Pa when tested in accordance with ASTME2178. Type 1 when tested in accordance with ASTM E 1677. ≤0.04 cfm/ft @ 75 Pa when tested in accordance with ASTM E2357.
2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E 96, Method B.
3. Water Penetration Resistance: 280 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 2.7 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
5. Air Infiltration Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D 822 , Method A.
7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84 . Flame Spread: 10, Smoke Developed: 10.

2.3 ACCESSORIES

A. Seam Tape: 3 inch wide DuPont™ Tyvek® Tape for commercial applications.

B. Fasteners:

1. Steel Frame Construction: DuPont™ Tyvek® Wrap Cap Screws,as manufactured by DuPont Building Innovations: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap fasteners.

2. Wood Frame Construction: #4 nails with large 1-inch plastic cap fasteners or 1-inch minimum plastic cap staple with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.

C. Sealants

1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.

2. Products:

a. DuPont™ Commercial Sealant.
b. Sealants recommended by the weather barrier manufacturer.

D. Adhesives:

1. Provide adhesive recommended by weather barrier manufacturer.

2. Products:

a. DuPont™ Adhesive/Primer
b. Adhesives recommend by the weather barrier manufacturer.

E. Primers:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

2. Products:

    a. DuPont™ Adhesive/Primer
    b. Primers recommended by the flashing manufacturer

F. Flashing

1. DuPont™ FlexWrap™: Flexible membrane flashing materials for window openings and penetrations.
2. DuPont™ FlexWrap™ NF: Flexible membrane flashing materials for window openings and penetrations.
3. DuPont™ StraightFlash™: Straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.
4. DuPont™ StraightFlash™ VF: Dual-sided flashing membrane materials for brick mold and non-flanged windows and doors.
5. DuPont™ Thru-Wall Surface Adhered Membrane with Integrated Drip Edge: Thru-Wall flashing membrane materials for flashing at changes in direction or elevation (shelf angles, foundations, etc.) and at transitions between different assembly materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations

B. Install weather barrier prior to installation of windows and doors.

C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier

1. Exterior corners: minimum 12 inches.
2. Seams: minimum 6 inches.

H. Weather Barrier Attachment:

1. Steel or Wood Frame Construction: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
2. Masonry Construction: Attach weather barrier to masonry. Secure using weather barrier manufacturer recommend fasteners, space 6-18 inches vertically on center and 24 inches maximum horizontally. Weather barrier may be temporarily attached to masonry using recommended adhesive, placed in vertical strips spaced 24 inches on center, when coordinated on the project site.

I. Apply 4 inch by 7 inch piece of DuPont ™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with non-flanged windows - all cladding types0

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.5 FLASHING (for use with non-flanged windows - all cladding types)

A. Cut 6 inch or 9 inch wide DuPont™ FlexWrap™ a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start StraightFlash™ at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.6 OPENING PREPARATION (for use with flanged windows)

A. Cut weather barrier in an "I-cut" pattern. A modified "I-cut" is also acceptable

1. Cut weather barrier horizontally along the bottom of the header.
2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.
3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
4. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING (for use with flanged windows)

A. Cut 6 inch or 9 inch wide DuPont™ FlexWrap™ a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 FIELD QUALITY CONTROL

A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.9 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 27 26
FLUID-APPLIED WEATHER BARRIERS
DuPont ™ Tyvek® Fluid Applied WB System

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied, vapor permeable weather barrier membrane. (DuPont™ Tyvek® Fluid Applied WB System.)

B. Joint Treatment:

1. Joint Tape.
2. Joint Compound. (DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound, trowel grade)

C. Flashing:

1. Vapor Permeable Fluid-Applied Elastomeric Flashing. (DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound)
2. Flexible Flashing.(DuPont™ FlexWrap™NF)
3. Sheet Flashing. (DuPont™ StraightFlash™)
4. Thru Wall Flashing. (Hyload™)

D. Sealant. (DuPont™ Sealant for Tyvek® Fluid Applied Systems)

E. Primers for flexible flashing and sheet flashing.

1.2 REFERENCES

A. ASTM International

1. ASTM C 1250 – Standard Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes.
2. ASTM D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
3. ASTM D 2240 – Standard Test Method for Rubber Property – Durometer Hardness.
4. ASTM D 4541 – Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
5. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E 96 - Test Method for Water Vapor Transmission of Materials
7. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
8. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylight, Doors and Curtain Walls by Uniform Static Air Pressure Differences.
9. ASTM E 779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
10. ASTM E 783 – Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

11. ASTM E 1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
12. ASTM E 1186 – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
13. ASTM E 1677 - Specification for Air Retarder Material or System for Framed Building Walls.
14. ASTM E 2178 – Standard Test Method for Air Permeance of Building Materials
15. ASTM E 2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
16. ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
17. ASTM C 1305 - Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane.

B. AATCC – American Association of Textile Chemists & Colorists

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test.

C. TAPPI

1. Test Method T-460; Air Resistance of Paper (Gurley Hill Method).

1.3 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.

B. Product Data: Submit manufacturer's current technical literature for each component.

C. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier system installation.

D. Closeout Submittals:

1. Refer to Section 01 70 00 Project Closeout.
2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer shall have experience with installation of commercial fluid-applied weather barrier assemblies under similar conditions.
2. Installer shall be trained and certified for installation by manufacturer.

B. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.

C. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

D. Mock-up:

1. Install mock-up using approved weather barrier system including membrane, flashing, joint and detailing compound and related weather barrier accessories according to weather barrier manufacturer's current printed instructions and recommendations.

   a. Mock-up size: 8 feet by 8 feet.
   b. Mock-up Substrate: Match wall assembly construction, including window opening.
   c. Mock-up may remain as part of the work.

2. Contact manufacturer's Tyvek® Specialist prior to weather barrier system installation, to perform required mock-up visual inspection and analysis as required for warranty.

E. Pre-installation Meeting

1. Refer to Section 01 31 00 Project Management and Coordination.
2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, certified installer, Owner's Representative, and weather barrier manufacturer's designated field representative.
3. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier system materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 Product Requirements.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier system with installation of windows, doors, louvers and flashings to provide a weather-tight barrier system.

B. Schedule installation of exterior cladding within nine months of weather barrier system installation.

1.7 WARRANTY

A. Limited Warranty

1. Manufacturer's warranty for weather barrier for a period of ten (10) years from date of Purchase.
2. Pre-installation meeting and jobsite observations by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 - PRODUCTS

2.1 WEATHER BARRIER

A. Manufacturer: DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1.800.44TYVEK (8-9835); http://weatherization.tyvek.com

1. Description: A single-component, low VOC, 25 mil thick synthetic polymer fluid-applied product with superior elasticity and flexibility providing resistance to air flow, bulk water and wind driven rain yet allows moisture vapor to escape.
2. Basis of Design: DuPont™ Tyvek® Fluid Applied WB System; including DuPont™ Tyvek® Fluid Applied WB, DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound, DuPont™ Tyvek® Fluid Applied Flashing – Brush Grade and DuPont™ Sealant for Tyvek® Fluid Applied Systems.

B. Performance Characteristics:

1. Air Penetration Resistance (Material):
   a. 0.0002 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E 2178.
   b. Air infiltration greater than 10,000 seconds per 100cc, when tested in accordance with TAPPI Test Method T-460.
2. Air Penetration Resistance (System / Assembly):
   a. ≤ 0.01 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E 2357.
   b. ≤ 0.01 cfm/ft2 at 75 Pa, Type I Air Barrier, when tested in accordance with ASTM E 1677.
3. Water Vapor Transmission: 25 perms, when tested in accordance with ASTM E 96, Method B at 25 mils DFT (Dry Film Thickness).
4. Water Penetration Resistance: Greater than 1000 cm when tested in accordance with AATCC Test Method 127. No leakage at 15 psf when tested in accordance with ASTM E 331.
5. Tensile Strength: Minimum 169 lbs/in^2, when tested in accordance with ASTM D 412.
6. Estimated Elongation: 420% in accordance with ASTM D 412.
7. Hardness: Passes at a Shore A hardness of 71, when tested in accordance with ASTM D 2240.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 25, Smoke Developed: 25.
9. UV Resistance: 9 months
10. Volatile Organic Content (VOC): Less than 2% (25-30 g/L) when measured in accordance with ASTM C 1250.
11. Adhesion Strength (Concrete): Greater than 33 psi when measured in accordance with ASTM D 4541.
12. Low Temperature Crack Bridging: Pass, when tested in accordance with ASTM C 1305.

2.2 ACCESSORIES

A. Joint Treatment:

1. Joint Tape:
   a. Product: Self-adhered fiberglass mesh tape as recommended by weather barrier manufacturer.
2. Joint Compound: Fluid-applied, vapor permeable, elastomeric flashing material; trowel applied.
   a. Product: DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound

B. Flashing:

1. Vapor permeable fluid-applied elastomeric flashing:
   a. Product: DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound
2. Flexible flashing with butyl adhesive layer.
   a. Product: DuPont™ FlexWrap™ NF.
3. Sheet flashing with butyl adhesive layer.
   a. Product: DuPont™ StraightFlash™.
4. Thru-Wall flashing, with butyl adhesive layer.
   a. Product: Hyload™ Thru Wall flashing, cloaks, and accessories.

C. Primers for flexible flashing and sheet flashing:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Products:
   a. DuPont™ Adhesive/Primer
   b. Hyload Hyprime Primer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 PREPARATION

A. Complete surface preparation, priming, flashing and detailing of openings, cracks, and material transitions prior to beginning installation of fluid-applied weather barrier system.

B. Surfaces shall be clean and free of frost, oil, grease, mold and efflorescence prior to application of fluid-applied weather barrier system.

3.3 INSTALLATION - DETAILING

A. Corners: Apply 1/2 inch fillet bead of joint compound applied to full-height of inside corners.

B. Joint treatment:

1. Sheathing:
   a. Joints shall be prepared per manufacturer's approved joint treatment details.
   b. Apply joint tape as recommended by fluid-applied weather barrier manufacturer.
      1) No joint treatment required for joints up to 1/16 inch.
      2) Joints 1/16 to 1/4 inch: Fluid-applied joint compound applied to form a 1 inch width on each side of sheathing joint; smooth joint compound across sheathing joint. Thickness shall be 15 to 25 mils.
      3) Joints 1/16 to 1/2 inch: Apply joint tape to bridge both sides of joint equally. Apply fluid-applied joint compound and trowel smooth embedding joint compound uniformly into joint tape to form a 1 inch width on each side of sheathing joint at a consistent thickness of 15 to 25 mils.
      4) Joints 1/2 to 1 inch: Apply sheet flashing primer above and below sheathing joint. Center sheet flashing over sheathing joint and press firmly in place per manufacturer's recommendations.
2. Non-movement joints in masonry and transitions to columns and beams:
   a. Joints 1/4 inch wide or less: Apply fluid-applied joint compound a minimum of 2 inches wide by 60 mils thick to each side of joint or crack.

b. Joints 1/4 to 1/2 inch: Apply joint tape to joint, then apply joint compound to joint 2 inches wide by 60 mils thick.

C. Apply fluid-applied joint compound to cladding anchors prior to installation of weather barrier membrane per manufacturer's instructions.

D. Apply fluid-applied joint compound around penetrations in exterior walls forming a fillet bead minimum ½ inch onto each surface.

E. Installation – Vapor permeable fluid-applied elastomeric flashing at openings:

1. At jambs and head of rough opening: Apply 25 mil thickness of fluid-applied flashing to full depth of opening and 2 inches onto outside face of opening.

F. Installation – Self-adhered flexible and sheet flashing at openings:

1. Prime substrates as recommended by self-adhered sheet membrane flashing manufacturer. Cut flexible flashing a minimum of 12 inches longer than length of sill rough opening.
2. Cover horizontal sill by aligning flexible flashing so that 2 inches will extend onto the face of the wall. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure sheet membrane tightly into corners by working in along the sill before adhering up the jambs.
3. Fan flexible flashing at bottom corners onto face of wall. Firmly press in place.
4. Apply 9-inch wide strips of sheet flashing at jambs. Align sheet flashing so that 2 inches will extend onto the face of the wall. Start sheet flashing at head of opening and lap sheet membrane at sill.
5. Coordinate flashing with fluid-applied weather barrier and window installation.

G. Allow Fluid-Applied Flashing, Joint Compound and Sealant to cure for minimum 24 hours before coating with Fluid-applied Weather Barrier.

3.4 INSTALLATION - FLUID-APPLIED WEATHER BARRIER

A. Install fluid-applied weather barrier prior to installation of windows, doors, and louvers.

B. Mask and protect any adjacent finished surfaces from fluid-applied weather barrier material.

C. Install fluid-applied weather barrier over exterior face of required exterior wall substrates in accordance with weather barrier manufacturer recommendations and instructions.

D. Install fluid-applied weather barrier by power-rolling method to achieve 25 mils providing a consistent and uniform thickness.

E. Repair any voids, holidays, or non-uniform installations or damage by other trades to proper mil thickness prior to installation of final cladding assemblies.

3.5 FIELD QUALITY CONTROL

A. Notify weather barrier manufacturer's designated representative to obtain required periodic observations of weather barrier system installation.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections as required in Contract Documents.

C. Inspections: Weather barrier materials, accessories, and installation are subject to inspection for compliance with performance requirements.

D. Tests: As determined by Owner's testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Weather barrier assemblies will be tested for air infiltration according to ASTM E 783.
2. Quantitative Air-Leakage Testing: Whole building air leakage will be tested in accordance with ASTM E 779, ASTM E 1827 or equivalent.
3. Qualitative Air-Leakage Testing: Weather barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186.
4. Qualitative Water-Leakage Testing: Weather barrier assemblies will be tested for water leakage according to ASTM E 1105.

E. Weather barriers assemblies will be considered defective upon failure of inspections and specific project testing required.

1. Apply additional fluid-applied weather barrier material, in accordance with manufacturer's instructions, where inspection results indicate insufficient thickness, voids, skips, pinholes or other defects as recommended by weather barrier manufacturer.
2. Remove and replace deficient weather barrier system components for retesting as specified above.

F. Repair damage to weather barriers caused by destructive testing; follow manufacturer's written instructions.

3.6 PROTECTION AND CLEANING

A. Protect weather barrier from contact with incompatible materials and sealants not approved per weather barrier manufacturer’s recommendation.

B. Protect installed weather barrier system from damage during construction prior to cladding installation.

1. If damaged or exposed to UV beyond nine (9) months, clean and prepare surfaces and install additional, full-thickness, fluid-applied weather barrier application in accordance with weather barrier manufacturer's instructions.

C. Remove masking materials and adjacent protection after weather barrier installation.

END OF SECTION

SECTION 07 60 00
SHEET METAL FLASHING AND TRIM

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Conditions of the Contract and Division 01 Specification Sections apply to this section.

1.2 SUMMARY

A. Note: All metal shall be supplied by the roofing membrane manufacturer and shall comply with and be included in the warranty specified in Section 07550. Metal cladding to be in conformance with ANSI SPRI ES-1 certification program.

B. Pitch pans, scuppers and all metal requiring solder/welding shall be .040 stainless steel.

C. All flat stock sheet metal materials used in the roofing system shall be supplied by The Garland Company, Inc. to maintain campus wide system standard and to provide the 20 year No Dollar Limit, (NDL) “Edge to Edge” (ETE) total system warranty. Metal color as selected by Owner.

D. Provide all labor, equipment, and materials to fabricate and install the following.

1. Edge strip and flashing.

2. Fascia and trim.

3. Coping cap at parapets.

4. Thru-wall flashings

E. Related Work Specified Elsewhere:

1. Division 06 Section Rough Carpentry

2. Division 07 Section Modified Bituminous Membrane Roofing

3. Division 07 Section Roof Accessories

4. Division 07 Section Roof & Deck Insulation

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.

2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.

3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

5. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

B. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI)

1. ANSI/SPRI ES-1 Testing and Certification Listing of Shop Fabricated Edge Metal

C. Warnock Hersey International, Inc., Middleton, WI (WH)

D. Factory Mutual Research Corporation (FMRC)

E. Underwriters Laboratories (UL)

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1. Latest Edition Architectural Sheet Metal Manual

G. National Roofing Contractors Association (NRCA)

1. Roofing and Waterproofing Manual

H. American Society of Civil Engineers (ASCE)

1. ASCE 7-05 Minimum Design Loads for Buildings and Other Structures.

1.4 SUBMITTALS FOR REVIEW

A. Product Data:

1. Provide manufacturer's specification data sheets for each product.

2. Metal material characteristics and installation recommendations.

3. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

B. Samples: Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.

C. Shop Drawings

1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.

2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.

3. Indicate type, gauge and finish of metal.

D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

1.5 SUBMITTALS FOR INFORMATION

A. Design Loads: Any material submitted must be accompanied by a report signed by a certified testing company. This report shall show that the submitted equal meets the wind uplift and perimeter attachment requirements according to ASCE 7-05 and ANSI/SPRI ES-1.

B. A letter from an officer of the fabricating company certifying that the materials furnished for this project are the same as represented in tests and supporting data.

C. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.

D. Certification of work progress inspection. Refer to Quality Assurance Article below.

E. Certifications:

1. Submit certification that the perimeter/edge metal products being used on this project have been tested according to ANSI/SPRI ES-1 criteria. Certification submitted must be provided by either NRCA, Independent Test Agency or the perimeter/edge metal manufacturer.

1.6 QUALITY ASSURANCE

A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years experience.

B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of five (5) years experience with the installation of similar system to that specified.

C. Upon request fabricator/installer shall submit work experience and evidence of financial responsibility. The Owner's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

1.8 PROJECT CONDITIONS

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal edge system.

1.9 DESIGN AND PERFORMANCE CRITERIA

A. Wind Uplift Pressures: Metal edge system must meet minimum design load pressures as determined by ASCE 7. Provide completed calculations to show ANSI/SPRI ES-1 test results meet the minimum wind uplift pressures.

B. Thermal expansion and contraction:

1. Completed metal edge flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

1.10 WARRANTIES

A. Owner shall receive one (1) warranty from manufacturer from Section 07550, including covering all of the following criteria. Multiple warranties are not acceptable.

1. Pre-finished metal material shall require a written twenty (20)-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D2244 or chalking excess of 8 units per ASTM D659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for a warranty.

3. Warranty shall commence on date of substantial completion or final payment, whichever is agreed by contract.

4. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

PART 2 — PRODUCTS

2.1 PRODUCTS, GENERAL

A. Refer to Division 01 Section "Common Product Requirements."

B. All Flat-Stock sheet metal will be supplied by the Roof Membrane Manufacture to incorporate it into their Edge to Edge roof warranty.

C. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

2.3 ACCEPTABLE FABRICATORS

A. Any fabricator which has been certified by the NRCA (National Roofing Contractors Association) to fabricate their ANSI/SPRI ES-1 tested profiles on their Gravel-Stop, Metal Edge, Fascia and Coping Cap products**.**

B. Provide a product carrying a signed and sealed Performance Test Report from a testing company for ANSI/SPRI ES-1 on their Gravel-Stop, Metal Edge, Fascia and Coping Cap products.

C. Any fabricator with a Gravel-Stop, Metal Edge, Fascia and Coping Cap products that has been tested in accordance with ANSI/SPRI ES-1 standards. Proof of this testing must be provided via a report signed and sealed by a qualified third party testing agency. This report shall show that the submitted equal meets the wind uplift and perimeter attachment requirements according to ASCE 7-05 and ANSI/SPRI ES-1. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance

2.4 MATERIALS

A. Where sheet metal is required and no material or gauge is indicated, match existing, furnish and install the highest quality and gauges commensurate with referenced standard.

B. Flashing:

1. Steel: 20 gauge galvanized steel, G90 galvanizing, ASTM A 525.

2. Pre-finished sheet metal: 22 gauge galvanized steel. KYNAR 500 Fluorocarbon coated, with strippable film. Color selected by Architect.

3. Wall Reglet and Counter flashing: Fabricate to match Fry Reglet Springlok (2 piece spring action type), Type SM galvanized, with factory fabricated corners, end cap and lap joints. Include wind clips.

C. Termination Bar: Slotted aluminum bar, Olympic Fasteners.

D. Lead Flashings: Sheet complying with FS QQ-L-201. Grade B; formed from Common Desilverised Pig Lead complying with ASTM B-29. Weight 4.0 lbs./sq.ft. unless otherwise specified.

2.5 RELATED MATERIALS AND ACCESSORIES

A. Metal Primer: Zinc chromate type.

B. Plastic Cement: ASTM D 4586

C. Sealant: Tuff-Stuff One part polyurethane sealant.

D. Underlayment: Self Adhering SBS membrane.

E. Slip Sheet: Rosin sized building paper.

F. Fasteners:

1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.

2. Fastening shall conform to Factory Mutual requirements or as stated on section details, whichever is more stringent.

G. Gutter and Downspout Anchorage Devices: Material as specified for system.

PART 3 — EXECUTION

3.1 EXECUTION, GENERAL

A. Refer to Division 07 Section Common Work Results for Thermal and Moisture Protection.

3.2 PROTECTION

A. Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.

3.3 GENERAL

A. Secure fascia to wood nailers at the bottom edge with a continuous cleat.

B. Fastening of metal to walls and wood blocking shall comply with building code standards.

C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.

D. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. Exposed face fastening will be rejected.

3.4 INSPECTION

A. Verify that curbs are solidly set and nailing strips located.

B. Perform field measurements prior to fabrication.

C. Coordinate work with work of other trades.

D. Verify that substrate is dry, clean and free of foreign matter.

E. Commencement of installation shall be considered acceptance of existing conditions.

3.5 SHOP-FABRICATED SHEET METAL

A. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

B. Hem exposed edges.

C. Angle bottom edges of exposed vertical surfaces to form drip.

D. Lap corners with adjoining pieces fastened and set in sealant.

E. Form joints for gravel stop fascia system, coping cap with a 3/8" opening between sections. Back the opening with an internal drainage plate formed to the profile of fascia piece.

F. Install sheet metal to comply with referenced ANSI/SPRI, SMACNA and NRCA standards.

3.6 CLEANING

A. Clean installed work in accordance with the manufacturer's instructions.

B. Replace damaged work than cannot be restored by normal cleaning methods.

3.7 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated. Comply with requirements of authorities having jurisdiction

3.8 FINAL INSPECTION

A. At completion of installation and associated work, meet with Contractor, Architect, installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Inspect work and flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Notify the Contractor upon completion of corrections.

E. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

F. Immediately correct roof leakage during construction. If the Contractor does not respond within twenty-four (24) hours, the Owner will exercise rights to correct the Work under the terms of the Conditions of the Contract.

END OF SECTION

SECTION 07 72 00
SAFEPRO ROOF HATCH ACCESS DOOR

I. PART ONE - GENERAL

1.01 SUMMARY
A. Work included: Furnishing and installing factory fabricated roof hatches

1.02 REFERENCES
A. American Society for Testing and Materials (ASTM, 1916 Race Street, Philadelphia, PA 19103; (215) 299-5400, fax (215) 977-9679
1. ASTM A 36-93a: Standard Specification for Structural Steel

1.03 SUBMITTALS
A. Product Data: Provide manufacturer's product data for all materials in this specification. Data Sheet/Brochure.
B. Shop Drawings: Show profiles, accessories, location, and dimensions.
C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
D. Contract Closeout: Roof hatch manufacturer shall provide the manufacturer's warranty prior to the contract closeout.

1.04 PRODUCT HANDLING
A. All materials shall be delivered in manufacturer's original packaging.
B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
C. Remove protective wrapping immediately after installation.

1.05 SUBSTITUTIONS
A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees proposed substitution shall meet the performance & quality standards of this specification.

1.06 JOB CONDITIONS
A. Verify that other trades with related work are complete before installing roof hatch(s).
B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
D. Coordinate installation with roof membrane & roof insulation manufacturer's instructions before starting.
E. Observe and follow all appropriate Federal and State (if applicable) OSHA safety guidelines.

1.07 WARRANTY/GUARANTEE
A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Openers, special finishes, and other special equipment shall be warranted separately by the manufacturers of those products.

II. PART TWO - PRODUCTS

2.01 MANUFACTURER

A. SafePro, L.P.
1357 N. Walton Walker, Dallas, TX 75211
phone 1-877-723-3570
fax 1-214-330-5435
www.safeprosafety.com

2.02 ROOF HATCH

A. Furnish and install where indicated on plans metal roof hatch Model SPH 3036 size 30 (width) x 36 (length). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.
B. Performance characteristics:
1. Cover(s) shall be reinforced to support a minimum live load of 40 psf (195 kg/m^2) with a maximum deflection of 1/150th of the span or 20 psf (97 kg/m^2) wind uplift.
2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the cover shall not be affected by temperature.
4. Entire hatch shall be weathertight with fully welded corner joints on cover and curb.
C. Cover: Shall be 14 gage (G90) galvanized steel with radius corners for safety and shall be fully welded at the corners for watertight construction. Cover shall have a rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
D. Cover insulation: Shall be 1” thick polyisocyanurate with an R-value of 5.6 (New ASTM C1289-13e1), fully covered and protected by an 14 gauge (G90) steel liner.
E. Curb: shall be 14 gage (G90) galvanized steel with durable re-coatable gray primer finish. It shall be 12” in height with a 3-1/2” wide mounting flange with holes for roof attachment.
The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners.
F. Curb insulation: Shall be 1” Fiber board.
G. Lifting mechanisms: For smooth operation of the cover, provide compression springs encased in zinc-plated telescopic tubes.Furnish an automatic hold-open arm with vinyl grip. For safety and added security,latching shall include interior & exterior handles with provisions for an inside padlock.
H. Hardware
1. Heavy pintle hinges shall be provided.
2. Cover(s) shall be equipped with a spring latch with interior and exterior turn handles.
3. Roof hatch shall be equipped with interior padlock hasps.
4. The latch strike shall be a welded component bolted to the curb assembly.
5. Cover shall automatically lock in the open position with an automatic hold-open arm with vinyl grip.
I. Finishes: Factory finish shall be Galvanized Steel with are-coatable gray primer finish.

III. PART THREE - EXECUTION

3.01 INSPECTION

A. Verify that roof hatch installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

A. Submit product design drawings for review and approval to the architect and/or specifier before fabrication.
B. The installer shall check as-built conditions and verify the manufacturer's roof hatch details for accuracy to fit the application prior to fabrication. The installer shall comply with the roof hatch manufacturer's installation instructions.
C. The installer shall furnish mechanical fasteners consistent with the roof requirements.

END OF SECTION

SECTION 07 72 60.01 [07 72 33.01]
ROOF HATCH SAFETY RAIL SYSTEM AND LADDER EXTENSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated roof hatch fall protection safety rail and ladder extension system installed on roof hatches.

1.02 RELATED REQUIREMENTS

A. Section 07 72 00 - Roof Accessories: Roof hatches.

B. Section 07 72 33 - Roof Hatches.

C. Section 07 72 33.01 [07 72 60.01] - Roof Hatch Safety Rail System: Fall protection safety rail system on roof hatches.

1.03 REFERENCE STANDARDS

A. ASTM A 500/A 500M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2007.

B. California Occupational Safety & Health Administration (CAL OSHA): 3209 - Standard Guardrails.

C. California Occupational Safety & Health Administration (CAL OSHA): 3212 - Floor Openings, Floor Holes and Roofs.

D. Occupational Safety & Health Administration (OSHA): 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes.

E. Occupational Safety & Health Administration (OSHA): 29 CFR 1910.27 - Fixed Ladders.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of roof hatch safety rail and ladder extension system with installation of new roof hatch and roof flashing. [Coordinate installation of roof hatch safety rail and ladder extension system with retrofit work on existing roof hatch].

B. Sequencing: Ensure that roof hatches and related flashings are complete prior to proceeding with installation of safety rail and ladder extension system.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's product data for complete safety rail system, including finishes.

C. Shop Drawings: Indicate profiles, accessories, location, quantities and dimensions.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate complete instructions for proper installation of safety rail system.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 2 years of documented experience.

B. Installer Qualifications: Manufacturer's certified installer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging.

B. Store products under cover, dry and elevated above grade.

1.08 FIELD CONDITIONS

A. Existing Conditions: Verify that existing roof hatches are suitable to receive proper installation of safety rail and ladder extension system. Notify Architect of conditions that would prevent proper installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Materials shall be free of defects in material and workmanship for a period of twenty (20) years from the date of purchase. Within this period, manufacturer shall replace defective components at no charge to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. SafePro L.P., 1355 N. Walton Walker, Dallas, TX 75211; Phone: 1-877-723-3570; Fax: 214-330-5435; Website: www.safeprosafety.com

B. Substitutions: See Section 01 60 00 - Product Requirement.

2.02 ROOF HATCH FALL PROTECTION SAFETY RAIL AND LADDER EXTENSION SYSTEM

A. Basis of Design: Roof Hatch Fall Protection Safety Rail Model No. SP-3630 by SafePro L.P.

B. Description: Steel tube railing system mounted on roof hatch providing an ergonomically correct power grip in a safe upright egress and ingress through roof hatches in addition to protection from accidental falls through roof opening while roof hatch is open. Includes top and mid-rail and wrap around self-closing gravity gate mounted with heavy duty hinges acting as a ladder extension.
   1. Steel Tubing: 1-1/2 inch hot rolled electric welded steel tubing, ASTM A500, Grade B, hot formed.
   2. Size: Formed to fit roof hatch size of 36 x 30 inches.
   3. Height: 42 inch above roof surface when mounted on standard roof hatch cap flashing.
   4. Mounting System: Integrated stanchions of rail system through bolted to extended cap flashing of roof hatch using 3/8 inch bolts.
   5. Gate System: Gravity self-closing, non-collapsible full wrap around steel tubing grab hold, welded construction. Heavy duty hinges with 5/8 inch hinge pin with built in pinch-less gate stop and pull up full open positioning.
   6. Fasteners: Stainless steel 316 Grade Hex head bolts, 3/8 inch x 2 inch, Nylon locking Hex nut and flat washers.

7. Labels: Furnish with manufacturer's standard labels containing safety warnings, fall dangers, “No Hoisting” warning and manufacturer identification.

C. Performance:
   1. Meets and exceeds OSHA Standard CFR 29 1910.23 and CFR 29 1910.27.
   2. Meet and exceeds Cal-OSHA §3212. Floor Openings, Floor Holes and Roofs and §3209. Standard Guardrails.

D. Fabrication: Factory formed and fully welded construction, free of sharp edges and snag points.

E. Finish: Factory finished with powder coating.
   1. Powder Coat Finish: Manufacturer's standard powder coating; color: Safety Yellow.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that roof hatch is suitable to receive proper installation of safety rail and ladder extension system. Report unsatisfactory conditions to Architect [Owner].

3.02 INSTALLATION

A. Install safety rail and ladder extension system in accordance with manufacturer's instructions using bolts furnished by railing manufacturer.

B. Install safety rail and ladder extension system by through-bolting to integral curb flashing of roof hatch, avoiding penetration of roof base flashing.

3.03 ADJUSTING

A. Adjust gate for smooth operation, free of binding.

END OF SECTION

SECTION 07 84 56
FIRE SAFING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, and services necessary for Insulation Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Fire Safing Insulation.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Concrete Work - Section 03 30 00.

2. Masonry - Section 04 20 00.

3. Steel Roof Decking - Section 05 31 23.

4. Cold-Formed Metal Framing - Section 05 40 00.

5. Rough Carpentry Work - Section 06 10 00.

6. Sheet Metal Work - Section 07 60 00.

7. Joint Protection - Section 07 90 00.

8. Aluminum Window Framing - Section 08 41 00.

9. Gypsum Sheathing and Wallboard - Section 09 29 00.

1.02 QUALITY ASSURANCE

A. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.03 SUBMITTALS

A. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

B. General: Submit Samples and manufacturer's literature to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

C. Samples: Submit two (2) 12" x 12" typical Samples of insulation type.

1.04 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

1.05 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding and ladders in accordance with applicable code requirements. Erect at times and locations so as not to delay any part of the Work, and promptly remove when no longer required.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 SAFING INSULATION

A. Manufacturer: Safing insulation specified herein shall be as manufactured by Thermafiber, Inc., 3711 West Mill Street, Wabash, IN 46992, (888) 834-2371 or (260)563-2111; www.thermafiber.com.

1. Insulation: "Thermafiber® Safing Insulation", mineral-wool type insulation, UL Reference = TYPE SAF, with approximate density of 4.0 to 6.0 pcf.

B. Comparable Products: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

C. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 90 percent.

D. Surface Burning Characteristics: Class A fire hazard classification in accordance with ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1. Regular (Unfaced): Flame Spread 0, and Smoke Developed 0.

2. Foil-Faced: Flame Spread maximum 25, and Smoke Developed 0.

E. Type and Quality: Rated noncombustible as defined by National Fire Protection Association NFPA Standard 220, when tested in accordance with ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C. Insulation shall be nonasbestos, moisture-resistant, noncorrosive, nondeteriorating, mildew-proof and vermin-proof.

F. Clips and Adhesives: Provide manufacturer's recommended galvanized steel safing clips and fire-resistant adhesives for installation of safing insulation.

1. Volatile Organic Compounds (VOC) Content: Adhesives and sealants product specified herein shall have a VOC content of 70 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 - Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 SAFING INSULATION INSTALLATION

A. Install safing insulation at locations indicated on the Drawings.

B. Install safing insulation (fire-stop insulation) at all openings through fire-rated partitions, and as indicated on the Drawings.

C. Compress and tightly fit safing insulation into the specified openings, securing in place with fireresistant adhesive and safing clips.

3.03 CLEAN-UP

A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.

B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.

C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

D. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 07 90 00
JOINT PROTECTION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, and services necessary for Caulking Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:

1. Preparation of surfaces.

2. Exterior and interior caulking of the following joint types. Exterior caulking shall be done with sealants, and interior caulking shall be with caulking compounds, however, selected interior locations noted on Drawings or specified herein will require sealant in lieu of caulking compound.

a. Between dissimilar materials, including concrete or masonry to metal (aluminum, steel, stainless steel), and steel to aluminum (at non-metallic shims).

b. Between similar materials as detailed, unless specifically excluded.

3. Expansion and control joints.

4. Between thresholds and adjoining materials.

5. Exterior joints where Mechanical and Electrical Work penetrates concrete or masonry.

6. Wherever indicated by the words, “Seal”, “Sealer”, “Sealant”, “Caulk”, or “Caulking” on the Drawings.

7. Acoustical Sealant.

8. Compressible Back-up Material as required.

9. Firestopping Systems.

10. Cleaning and removing excess materials.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Cast in Place Concrete - Section 03 30 00.

2. Unit Structural Masonry - Section 04 23 0.

3. Rough Carpentry - Section 06 10 00.

4. Thermal Insulation - Section 07 21 00.

5. Plaster Veneer System - Section 07 24 00.

6. Sheet Metal Work - Section 07 60 00.

7. Fire Safing - Section 07 84 56.

8. Hollow Metal Doors and Frames - Section 08 11 13.

9. Aluminum Framed Entrances and Storefronts - Sections 08 41 13.

10. Gypsum Wallboard - Section 09 29 00.

11. Paints and Coatings - Section 09 90 00.

12. Caulking and Mastic Operations at Roof and Sealing Sheet Metal Flashings - By Roofing Contractor.

1.02 QUALITY ASSURANCE

A. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.03 SUBMITTALS

A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Product Data: Submit manufacturer's specification and recommendations for each type of sealant, caulking compound, expansion joint cover, and miscellaneous material required.

D. Sealant Compatibility and Test Reports: Provide reports from sealant manufacturer certifying that materials forming joint substrates of system have been tested for compatibility and adhesion with joint sealants; include sealant manufacturer's interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

E. Samples: Submit Samples of sealants and caulking for review and approval by the Architect. Do not commence Work until the Architect's written approval of the Samples has been received.

1. General: Submit two (2) 12" long Samples of each color and type of exposed-to-view sealant and caulk. Install Sample in 1/2" wide joints between two (2) strips of material representative of exposed surfaces adjacent to joint sealants. Manufacturer's color charts and/or color swatches will not be accepted as Samples.

2. Expansion Joint Covers: Provide samples of sealant system in colors as required to match with adjacent finished surfaces.

1.04 PRODUCT DELIVERY AND STORAGE

A. Delivery: Ship material to job site in plainly marked, original containers, with seals unbroken. Do not ship opened or partially full containers to the site. Materials will be subject to inspection, and rejection at any time. Unload materials at locations designated by the General Contractor.

B. Storage: All materials shall be stored in sheltered enclosures with ambient temperature range of 60 to 80 degree F° at the site until ready for use.

C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.05 PROJECT CONDITIONS

A. Temperature and Temporary Enclosures: Do not install compounds when ambient air temperature is less than 40°F. or when recesses are wet or damp. Temporary enclosures and temporary heat may be provided to maintain temperature requirements.

B. Protection: Adjacent finished surfaces shall be protected from damage, by masking or other approved methods, prior to sealing. Remove protection when no longer needed, clean adjacent surfaces smeared by compounds.

1.06 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding and tarpaulin enclosures, complying with governing code requirements. Erect apparatus at times and locations so as not to delay any part of Work. When Work
has been completed, promptly dismantle all scaffoldings and remove from site.

1.07 WARRANTY

A. General Requirements: The warranty shall state that the Contractor will make good at his expense, all imperfections which may develop in Caulking and Sealing Work during the warranty period, as well as damage to other Work caused by imperfections or by repairing imperfections.

B. Sealant Work: Execute a warranty in the approved written form, warranting all Sealant Work to remain in a serviceable, watertight, elastic, adhesive and perfect condition for a period of not less than three (3) years from date of Owner's acceptance of the installation.

C. Caulking Work: Execute a warranty in the approved written form, warranting all Caulking Work to remain in a serviceable, watertight, elastic, adhesive and perfect condition for a period of not less than two (2) years from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Colors: Sealants and caulking compounds shall be of colors as selected and/or reviewed by the Architect to match adjacent finish surfaces.

2. Grade and Consistency: Sealants and caulking compounds shall be of correct grade and consistency for application, to flow easily from application gun, and to tool without excessive tackiness.

3. Material Properties: Set sealants and caulking compounds shall be waterproof, elastic, non-staining and non-corrosive; firm but not brittle hard; remain plastic without cracking at low temperatures; non-sagging at temperatures up to 120°F for 24 hours.

4. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

5. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Architectural Sealants: Not more than 250 g/L.

   b. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.

   c. Sealant Primers for Porous Substrates: Not more than 775 g/L.

B. Sealants:

1. Sealants - General: Multiple-component polyurethane sealant, non-sag type, conforming to ASTM C920 - Standard Specification for Elastomeric Joint Sealants, Type M, Grade NS, and Federal Specification TT-S-00227E, Type II, Class A, by one of the following manufacturers:

   a. Manufacturer: BASF Construction Chemicals, LLC - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)243-6739 or (800)433-9517; www.BuildingSystems.BASF.com.

      1) Product: Sonneborn® "Sonolastic® NP 2Ô.

   b. Manufacturer: Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (800)523-6688 or (215)723-6051; www.pecora.com.

      1) Product: Dynatrol® II.

   c. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.

      1) Products: Dymeric 240 or Dymeric® 240FC.

2. Sealant for Exterior Plaster Veneer System: Product shall be acceptable to Plaster Veneer System Manufacturer. Sealant shall conform to ASTM Standard C920, Grade NS, Class 50, by one of the following manufacturers:

   b. Manufacturer: Dow Corning Corporation, South Saginaw Road, Midland, MI 48686, (800)662-0661 or (989)496-6000; www.dowcorning.com.

1) Product: Dow Corning® 790 Silicone Building Sealant, one-component silicone sealant.

c. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.

1) Products: Spectrem® 1 or Spectrem® 3 one-component silicone sealant, “Spectrem® 4-TS” multiple-component silicone sealant or “Dymeric® 240FC” multiple-component polyurethane sealant.

3. Sealant for Traffic Areas: One-component polyurethane sealant, non-sag type, for use in traffic areas, per ASTM Standard C920, by one of the following manufacturers:

a. Manufacturer: BASF Construction Chemicals, LLC - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)243-6739 or (800)433-9517; www.BuildingSystems.BASF.com.

1) Product: Sonneborn® Sonolastic® NP 1Ô.

b. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.

1) Products: Dymonic® FC or Vulkem® 45 SSL.

c. Manufacturer: LymTal International, Inc., 4150 S. Lapeer Road, Lake Orion, MI 48359, (248)373-8100; www.lymtal.com.

1) Product: Iso-Flex® 830, Joint Sealant.

4. Acoustical Sealant: Equivalent to SHEETROCK® Brand Acoustical Sealant as manufactured by United States Gypsum Company, A Subsidiary of USG Corporation, 550 West Adams Street, Chicago, IL 60661, (800)874-4968; www.usg.com.

a. Product Requirements: Acoustical sealant shall be an acrylic, latex-based caulk for use as a joint sealant for sealing sound-rated systems. Sealant shall be non-staining and paintable. Sealant shall meet ASTM Standard C834 and tested in accordance with ASTM Standard E90.

b. Surface Burning Characteristics: Classified by UL, and tested in accordance with ASTM Standard E84:

1) Flame Spread: 0.

2) Smoke Developed: 0.

c. VOC Content: Less than 15 grams/liter.

C. Caulking Compounds:

1. Caulking Compounds - General: One-part, acrylic latex sealant, non-sag type, conforming to ASTM C834 - Standard Specification for Latex Sealants, by one of the following manufacturers:

a. Manufacturer: Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (800)523-6688 or (215)723-6051; www.pecora.com.

1) Product: AC-20® + Silicone.

b. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.

1) Product: Tremflex® 834.

D. Primers: Provide primer products recommended by the sealant or caulking compound manufacturer, to provide adhesion of the sealant and caulking compounds to, and to prevent staining of adjacent surfaces.

E. Back-up Material:

1. Manufacturer: Construction Foam Products, a Division of Nomaco, Inc., 501 NMC Drive, Zebulon, NC 27597, (800)345-7279 or (919)380-6640; www.cfoamproducts.com.
2. Product: Round, Foam Rod, cylindrical, flexible, extruded, compressible closed cell, polyethylene foam backer rod, Type C - per ASTM Standard C1330, such as Closed-Cell Backer Rod “HBR®”. Provide backer rods in diameters 1/2 larger than width of joints in which rods are installed.

2.02 FIRESTOPPING SYSTEMS:

A. Construction Penetrations: UL Listed firestopping system for through-penetrations shall meet the requirements of ASTM Standard E814 (UL 1479) and provide a fire rating equal to that of construction being penetrated. Backing material and sealant shall not contain asbestos, halogens, and volatile solvents, and shall be flexible to allow for normal

movement of building and penetrating items without adversely affecting the integrity of the system.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: Not more than 250 g/L.

2. Sealant Primers for Nonporous Substrates: Not more than 250 g/L.

3. Sealant Primers for Porous Substrates: Not more than 775 g/L.

C. Firestopping Systems: Provide system/products by one of the following manufacturers:

1. Manufacturer: Hilti, Inc., 5400 South 122nd. East Avenue, Tulsa, OK 74146, (800)879-8000 or (918)252-6000; www.us.hilti.com.

a. System/Products: Hilti Firestop Systems.

2. Manufacturer: Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (800)523-6688 or (215)723-6051; www.pecora.com.

a. System/Products: Firestop Systems-UL® Classified.

3. Manufacturer: RectorSeal® Corporation, 2601 Spenwick Drive, Houston, TX 77055, (800)231-3345 or (713)263-8001; www.rectorseal.com.

a. System/Products: Metacaulk® Firestop Materials.

4. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.

a. System/Products: TREMstop® Fire Protection Products and related products.

D. Comparable Systems/Products: Comparable equivalent products of other manufacturers may be acceptable, subject to conformance with these Specifications and the Architect's review.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSPECTION

A. Inspect all joints to be caulked. Notify the General Contractor in writing (copy to the Architect), of any condition that will prevent the required performances of the compounds, for correction. Installation of the compounds will be considered Contractor's acceptance of the joints. Promptly repair or replace all Caulking and Sealing Work that becomes damaged or defective because of defects in the joint surfaces,
to the satisfaction of the Architect, and at no cost to the Owner.

3.03 PREPARATION

A. Joints to be caulked will be raked out or left open 3/8" to 1/2" deep, maximum by others. Joint width to be 1/2" maximum, 3/8" width for control joints.

B. Clean recesses to receive compound so as be free of dirt, dust, loose material, oil, grease, and all other substances detrimental to the material's performance. Remove lacquer or other protective coatings from metal surfaces, without damage to the surface, prior to sealing. Recesses shall be dry when compounds are installed.

C. If sealing or caulking compounds cause stains on, or do not adhere to, adjacent materials, or if recommended by compound manufacturer, prime all surfaces with specified primer in accordance with compound manufacturer's recommendations.

D. Width or depth of the joint shall be not less than 1/4". In joints up to 1/2" wide, the depth of the sealant shall be equal to the width. In joints wider than 1/2", but not exceeding 1", the depth shall be maintained at 1/2". Joints wider than 1" shall maintain a width to depth ratio of 2 to 1. Fill recesses with backer rod, held back the specified depth from the surface, where joint depths exceed the specified maximums.

E. If joints to receive sealant are filled with other than backer rod specified material, adhere a strip of polyethylene film over the exposed edge of the material, to break the bond of the sealant.

F. Use materials as manufactured, without additives or adulterations. Mix two (or three) component materials until thoroughly and uniformly blended, and then install such materials prior to start of hardening or curing of the materials.

3.04 INSTALLATION OF SEALANTS AND CAULKING COMPOUNDS - GENERAL

A. Sealants and caulking compounds for use in any one area shall be of one brand throughout, mixing of brands on a single wall or in a single room or area is prohibited.

B. All Work shall be done by experienced workmen, in accordance with manufacturer's recommendations, and as specified herein.

C. Install all sealing and caulking compounds immediately after the adjoining Work of other trades is in proper condition to receive same, but before Work has been given applied finishes such as painting or staining, and in a manner to prevent damage occurring by reason of any delay in providing the Work specified herein. No sealing or caulking shall be done until the General Contractor has inspected and approved the preparatory Work and the condition of the adjoining Work.

D. Fill joints completely with sealant and/or caulking compound, without extra cost to the Owner, regardless of variance in joint widths.

E. Install sealants and caulking compounds under pressure, without smearing adjacent surfaces. Compounds shall have full and uniform contact and adhesion with sides of joint recesses.

F. Finish sealants and caulking compounds in recesses, in angular surfaces, with a smooth surface, flush with face of material at each side. Finish sealants and caulking compounds, in recesses, between masonry and jambs, with a smooth surface, flush with the face of the metal frame on one side and with face of masonry on the other side. Finish sealants and caulking compounds in recesses, in flush surfaces (including masonry walls), with a smooth concave surface, flush with face of material at each side.

G. Surfaces of sealants and caulking compounds in joints shall be smooth and even, free from dirt, stain or other defacements, and be uniform in color throughout.

H. Tooling of joints will be allowed, provided that such operations do not damage the seal or tear the compounds.

3.05 INSTALLATION OF SEALING COMPOUNDS

A. Building Exterior: Fill with sealant, as required to provide a weathertight condition, all exposed joints that are not subject to movement but require finishing, and all joints that are not subject to excessive movement. Principal locations shall include, but not be limited to, the following:

1. Joints between Dissimilar Materials: All exposed joints in the exterior walls, between dissimilar materials, including masonry or concrete construction to metal

(aluminum, steel, stainless steel) such as door frames, frames for glass and other miscellaneous openings; and steel to aluminum (at non-metallic shims).

2. Joints between Similar Materials: All joints between similar materials such as masonry control joints, etc., unless specifically excluded.

3. Noted Locations: Wherever indicated by the words “seal” or “sealant” on the Drawings.

4. Exterior Plaster Veneer: Joint filler, primer, and bond breaker shall be in accordance with the sealant manufacturer’s specifications and instructions. Application of the sealant shall be as recommended by the plaster veneer system manufacturer, subject to review by the Architect.

   a. Back-up Material: Sealant backer rods, as required by field conditions shall be of closed cell.

   b. Textured Finishes or Base Coat Surfaces: Sealant shall not be applied directly to textured finishes or base coat surfaces. Plaster veneer system base coat surfaces subject to be in contact with sealant shall be coated with acrylic coating or pigmented acrylic primer. Coordinate Work with Plaster Veneer System Contractor.

B. Building Interior: Fill with sealant, as required to provide a closed condition, all exposed joints that are subject to movement, but not excessive movement, or where specifically noted on Drawings. Principal locations shall include, but not be limited to the following:

1. Joints Between Dissimilar Materials: All exposed joints in exterior and interior walls, between dissimilar materials generally, including masonry or concrete to metal (aluminum, steel, stainless steel), such as door frames, frames for glass and other openings, and steel to aluminum (at non-metallic shims).

2. Joints Between Similar Materials: All exposed joints between similar materials such as masonry control joints, unless specifically excluded.

C. Acoustical Sealant: Comply with sealant manufacturer’s written directions and instructions for preparation and application of sealant.

1. Coordinate with Gypsum Wallboard Contractor for installation of coustical sealant at sound-rated partitions where indicated on the Drawings; applied in accordance with ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications, using conventional caulking equipment.

2. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.

3. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.

4. Provide continuous bead of sealant behind faces of control joints prior to installation of control joint accessories.

5. After installation of gypsum board base layer(s), fill open space between gypsum board and floor, ceiling and dissimilar vertical construction with continuous sealant beads after installation of face layer.

6. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.

7. Seal sides and backs of electrical boxes to completely close off openings and joints.

8. Sound Flanking Paths:

   a. Where sound-rated partition walls intersect non-rated gypsum board partition walls, provide acoustical sealant at extended sound-rated construction to completely close sound flanking paths through non-rated construction.

   b. Seal joints between face layers at vertical interior angles of intersecting partitions.

3.06 INSTALLATION OF CAULKING COMPOUNDS

A. Building Interior: At interior of building, fill with caulking compound, all exposed joints not subject to movement that require a finished appearance. Principal locations shall include, but not be limited to the following:

1. Joints in interior walls, between masonry and metal frames.

2. Joints in interior walls, between masonry and adjacent construction.

3. Wherever indicated by the words “caulk” or “caulking” on the Drawings, except if the locations are specified to be sealed.

3.07 INSTALLATION OF FIRESTOPPING SYSTEM

A. Prepare substrate surfaces to insure proper support for firestop system. Clean surfaces of all foreign material including loose debris, dirt, oil, grease, and wax. Install firestop material in accordance with manufacturer’s printed instructions and UL requirements.

3.08 CLEANING

A. Excess Sealing and Caulking Materials: Remove excess sealing and caulking materials from adjacent surfaces before materials have set up. Follow manufacturer's instructions for removal of sealing and caulking materials from finished surfaces. Repair surfaces damaged by sealing and caulking operations. Obtain written approval, from the Architect, of the entire installation after completion.

B. Debris and Waste Materials: During progress of the Work, keep the premises free of debris and waste materials resulting from Sealing and Caulking Work. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site, and dispose of legally. Upon completion and before final acceptance of the Work, remove unused materials, tools, and equipment from the site.

C. Waste Management: Collect field generated construction waste created during construction or final.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Polysulfide joint sealants.
4. Latex joint sealants.
5. Solvent-release-curing joint sealants.
6. Preformed joint sealants.
7. Acoustical joint sealants.

B. Related Sections:

1. Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Section 079500 "Expansion Control" for building expansion joints.
3. Section 078446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
4. Section 084423 "Structural-Sealant-Glazed Curtain Walls" for structural and other glazing sealants.
5. Section 088000 "Glazing" for glazing sealants.
6. Section 088400 "Plastic Glazing" for plastic glazing sealants.
7. Section 092613 "Gypsum Veneer Plastering" for sealing perimeter joints and penetrations.
8. Section 092900 "Gypsum Board" for sealing perimeter joints.
9. Section 093000 "Tiling" for sealing tile joints.
10. Section 095113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.
11. Section 096313.35 "Chemical-Resistant Brick Flooring" for sealing flooring joints.
12. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than 5 pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf
c. Tremco Incorporated; Spectrem 1.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:
   a. Dow Corning Corporation; 795.
   b. GE Advanced Materials - Silicones; SilPruf SCS2000.
   c. Tremco Incorporated; Spectrem 2.

C. Mildew Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:
   a. Dow Corning Corporation; 999-A.
   b. GE Advanced Materials - Silicones; Contractors SCS1000 .
   c. Tremco Incorporated; Tremsil 200.

D. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide the following:

   a. Dow Corning Corporation; NS Parking Structure Sealant.
   b. Pecora Corporation; 301 NS.
   c. Tremco Incorporated; Spectrem 800.
   .

E. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:

   a. Tremco Incorporated; Spectrem 4TS.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:

   a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
   b. Tremco Incorporated; Dymonic 100

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide the following:

   a. BASF Building Systems; Sonolastic NP1.

b. Sika Corporation, Construction Products Division
c. Tremco Incorporated; Vulkem 45SSL.

C. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:

a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240 FC.
.

D. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.

1. Products: Subject to compliance with requirements, provide the following:

a. Polymeric Systems, Inc.; PSI-270.
b. Tremco Incorporated; Dymeric 240 FC.

E. Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, provide the following:

a. BASF Building Systems; Sonolastic NP1.
b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
c. Tremco Incorporated; Vulkem 45SSl.
.

F. Immersible, Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, provide the following:

a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
b. Tremco Incorporated; Vulkem 45.

G. Immersible Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.

1. Products: Subject to compliance with requirements, provide the following:

a. BASF Building Systems; Sonolastic NP 2.
b. Pecora Corporation; Dynatred.
c. Tremco Incorporated; Vulkem 45SSL.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide the following:

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Tremco Incorporated; Tremflex 834.

2.5 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide the following:

a. Dow Corning Corporation; 123 Silicone Seal.
b. GE Advanced Materials - Silicones; UltraSpan US1100.
c. Tremco Inc, Simple Seal

B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Products: Subject to compliance with requirements, provide the following:

a. Dayton Superior Specialty Chemicals; Polytite Standard.
b. EMSEAL Joint Systems, Ltd.; Emseal 25V.
a. Tremco Inc; illmod 600.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide the following:

a. Pecora Corporation; AC-20 FTR.
b. USG Corporation; SHEETROCK Acoustical Sealant.
c. **TREMCO INC, TREMflex 834**>.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage

or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-#.

1. Joint Locations:

   a. Control and expansion joints in brick pavers.
   b. Isolation and contraction joints in cast-in-place concrete slabs.
   c. Joints between plant-precast architectural concrete paving units.
   d. Joints in stone paving units, including steps.
   e. Tile control and expansion joints.
   f. Joints between different materials listed above.
   g. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, nonsag, traffic grade.
4. Polysulfide Joint Sealant: Multicomponent, nonsag, traffic grade.
5. Preformed Joint Sealant: Preformed foam sealant.
6. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion JS-#.

1. Joint Locations:

   a. Joints in pedestrian plazas.
   b. Joints in swimming pool decks.
   c. Other joints as indicated.

2. Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade.
3. Polysulfide Joint Sealant: Immersible, multicomponent, nonsag, traffic grade.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-#.

1. Joint Locations:

   a. Construction joints in cast-in-place concrete.
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints in dimension stone cladding.
   e. Joints in glass unit masonry assemblies.
   f. Joints in exterior insulation and finish systems.
   g. Joints between metal panels.
   h. Joints between different materials listed above.
   i. Perimeter joints between materials listed above and frames of doors and windows.
   j. Control and expansion joints in ceilings and other overhead surfaces.

k. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50, Class 25.
3. Urethane Joint Sealant: Single component, nonsag, Class 100/50] [Single component, nonsag, Class 50.
4. Polysulfide Joint Sealant: Single component, nonsag.
5. Preformed Joint Sealant: Preformed silicone.
6. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-#.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, nonsag, traffic grade.
4. Polysulfide Joint Sealant: Multicomponent, nonsag, traffic grade.
5. Preformed Joint Sealant: Preformed foam.
6. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry, concrete walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of [interior doors and windows].
f. Other joints as indicated.

2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces JS-#.

1. Joint Location:

    a. Acoustical joints where indicated.
    b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Wood Doors” for wood doors in hollow metal frames.
3. Division 08 Section "Door Hardware (Scheduled by Describing Products)" for door hardware for hollow metal doors and frames.
4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of electrical knockout boxes and preparations for power, signal, and control systems.

C. Samples for Verification:

1. Samples are only required by request of the architect and for manufactures that are not current members of Steel Door Institute.
2. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).
3. For the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105.

E. Preinstallation Conference: Conduct conference at Project site for hollow metal frames requiring electrical knockout boxes to verify installation of conduit on frames.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with this section requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.
5. No Substitution; only material from an SDI member will be allowed on the jobsite unless prior approval is given in accordance with substitution request requirements per General Requirements section.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide 1 3/4" thick beveled and handed doors of design indicated, fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel
2. Core Construction: Manufacturer's standard polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-rated assemblies with R Factor 11 or better.

        1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Beveled edge

    a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheets. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm-) thick steel, Model 2 (Seamless face and edges).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm-) thick steel, Model 2 (Seamless face and edges).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheets.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded joints and back weld joints continuously, unless otherwise indicated.
3. Frames for Level 3 Steel Doors: minimum 14 gauge 0.067-inch- (1.7-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 3 Steel Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.
5. Frames 48-inches and wider in opening width are required to be minimum 14 gauge 0.067-inch- (1.7-mm-) thick steel sheet.
6. Frames for Wood Doors: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.
7. Frames for Borrowed Lights: minimum 16 gauge 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engauge stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches (0.4 mm) thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8

C. Hollow Metal Doors:

1. Exterior Doors:

    a. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Top of door to be flush and completely sealed joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors with applied flush trim to fit.
3. Astragals: Provide overlapping astragal as noted in door hardware sets in Division 8 Door Hardware on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
4. Electrical Raceways: Provide raceways for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Door Hardware. Provide sufficient number of concealed

wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

5. Seamless Edge: Provide seamless edge on hollow metal doors by intermittently tack welding seam, grinding smooth and finishing edge free from defects and blemishes.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Continuously backweld joints at exterior frames.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops required wider dimension on glass side of frame.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 42-inch and wider with mortise/butt type hinges only at top hinge location to deter against hinge reinforcement sag.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops; provide security head screws at exterior locations.
6. Grout Guards: Weld guard boxes to frame at back of mortise hardware prep in frames at all hinge, strike and other recessed hardware preps regardless of grouting requirements.
7. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; included but not limited to electric thru wire hinges, electrical raceways, door position switches, electric strikes, jamb mount card readers, and magnetic locks as noted in door hardware sets in Division 8 Door Hardware.

    a. Electrical knock out boxes are required at door position switches, electric strikes, card readers, and middle hinge locations for all exterior locations regardless of electrical hardware specified in Division 8 Door Hardware.
    b. Provide electrical knock out boxes with 3/4-inch knockouts.
    c. Conduit to be coordinated and installed in field from middle hinge box and strike box to door position box.
    d. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 8 Door Hardware.
    e. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
    f. Provide field installed conduit per Division 28 section for standardized plug connectors to accommodate up to twelve (12) wires as required for electrified door hardware specified in hardware sets in Division 8 Door Hardware. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Wire nut connections are not acceptable.

8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Two anchors per jamb up to 60 inches (1524 mm) high.
2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

10. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers as follows. Keep holes clear during construction. Silencers to be supplied by frame manufacture regardless if specified in division 8 Door Hardware.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricators shop

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that glazed lites are capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
5. Gap for butted or mitered joints in glass stop should not exceed .0625-inch.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. Field Supplied Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Grouting Requirements:

    a. Do not grout head of frames unless reinforcing has been installed in head of frame.
    b. Do not grout vertical or horizontal closed mullion members.

8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

    a. Secure exterior removable stops with security head screws.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 17 43
COMPOSITE FIBERGLASS DOOR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. AF-200 Smooth Composite Fiberglass Door with PP Polypropylene Honeycomb Core.
B. AF-200 Smooth Composite Fiberglass Door with Expanded Polystyrene Core.
C. AF-200 Smooth Composite Fiberglass Door with PP Polypropylene Honeycomb Core Installed in AF-150 Pultruded Fiberglass Framing.
D. AF-200 Smooth Composite Fiberglass Door with PP Polypropylene Honeycomb Core Installed in AF-250 Pultruded Fiberglass Framing.
E. AF-200 Smooth Composite Fiberglass Door with Expanded Polystyrene Core installed in AF-150 Pultruded Fiberglass Framing.
F. AF-200 Smooth Composite Fiberglass Door with Expanded Polystyrene Core installed in AF-250 Pultruded Fiberglass Framing.

1.02 RELATED SECTIONS

A. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
B. Section 08 06 71 – Door Hardware Schedule.
C. Section 08 06 80 – Glazing Schedule.
D. Section 08 10 00 – Doors and Frames.
E. Section 08 12 16 – Aluminum Frames.
F. Section 08 42 13 – Aluminum-Framed Entrances.
G. Section 08 71 00 – Door Hardware.
H. Section 08 91 26 – Door Louvers.

1.03 REFRENCES

A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
B. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
C. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
D. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
E. ASTM-D695 – Standard Test Method for Compression Properties of Rigid Plastics.
F. ASTM-D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 °C and 30 °C with a Vitreous Silica Dilatometer.
G. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
H. ASTM-D792 – Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
I. ASTM-D1761 – Standard Test Methods for Mechanical Fasteners in Wood.
J. ASTM-D2344 – Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates.
K. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impresser.
L. ASTM-D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
M. ASTM-D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
N. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.

O. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
P. ASTM-E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
Q. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.
R. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.

1.04 SUBMITTALS

A. Must comply with Section 01 33 00 – Submittal Procedures.
B. Action Submittals/ Informational Submittals.
    1. Product Data.
        a. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
    2. Shop Drawings.
        a. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
    3. Samples.
        a. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
        b. Submit manufacturer's sample of standard colors for door face and frame.
    4. Testing and Evaluation Reports.
        a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.
    5. Manufacturer Reports.
        a. Manufacturer's Project References.
            1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
C. Closeout Submittals.
    1. Operation and Maintenance Manual.
        a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
    2. Warranty Documentation.
        a. Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications.
    1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
    2. Door and frame components must be fabricated by same manufacturer.
    3. Evidence of a documented complaint resolution quality management system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery.
    1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
    2. Labels clearly identifying opening, door mark, and manufacturer.
B. Storage.
    1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
C. Handling.
    1. Protect materials and finish from damage during handling and installation.

1.07 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
B. Standard Period.
   1. Ten years starting on date of shipment.
C. Limited lifetime
   1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
D. Finish
   1. Painted AF-200, AF-150 frames, AF-250 frames: 3 years.
   2. Thresholds do not have a finish warranty.

PART 2 PRODUCTS

2.01 COMPOSITE FIBERGLASS DOOR

A. Manufacturer.
   1. Special-Lite, Inc.
      a. PO Box 6, Decatur, Michigan 49045.
      b. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
      c. Web Site www.special-lite.com.
      d. E-Mail info@special-lite.com.

2.02 DESCRIPTION

A. Model.
   1. AF-200 Smooth Composite Fiberglass Door.
B. Door Opening Size.
   1. Per Door Schedule
C. Construction.
   1. Door Thickness.
      a. 1-3/4".
   2. Stiles & Rails.
      a. Pultruded fiberglass with integral channels for securing corner reinforcing clip.
   3. Corners.
      a. Mitered.
      b. Secured with pultruded fiberglass corner clip chemically welded to stiles and rails.
      c. Mechanical fasteners to secure corner joints not acceptable.
   4. Core.
      a. Expanded Polystyrene.
      b. PP Polypropylene Honeycomb.
         1. 5.0 pcf density.
         2. High strength to weight ratio.
         3. Corrosion, fungi, rot, chemical and moisture resistant.
         4. Sound and vibration dampening.
         5. Energy absorbing and recyclable.
      c. Expanded Polystyrene.
         1. 2.0 pcf
         2. Mildew and rot resistant.
         3. Sound and vibration dampening.
   5. Face Sheet.
      a. Interior and Exterior
         1. 0.090" thick, Class C, smooth texture, painted FRP sheet.

b. Attachment of face sheet.
1. Face sheets to be flame treated to promote durable, long lasting bond.
2. Face sheets adhered to stiles, rails, and core using hot melt adhesive evenly coated across all surfaces to produce strong bond and prevent moisture absorption.

6. Cutouts.
a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
7. Hardware.
a. Pre-machine doors in accordance with templates from specified hardware manufacturers.
b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
8. Reinforcements.
a. Solid high-density polyurethane shapes chemically welded to stiles, rails and/ or core.
b. No metallic reinforcements will be allowed.

2.03 FRAMING
A. Framing
1. AF-150.
a. Jamb Depth.
1. Custom size, see drawings.
b. Materials.
1. See 2.05.A.
c. Perimeter Frame Members.
1. ¼" thick pultruded fiberglass open throat with return.
2. Factory fabricated.
3. 2" or 4" face available for frame headers.
d. Transoms and Sidelites.
1. Same as perimeter frame members.
2. Removable stop for ¼", 5/8" or 1" glass or panels.
e. Integral Door Stops.
1. 5/8" x 2-1/4".
f. Frame Assembly.
1. Single frames chemically welded at factory.
2. Pairs knock down for field assembly.
g. Frame Member to Member Connections.
1. Corners mitered with 4" x 4" x 3/8" pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
2. All member to member connections chemically welded at factory unless in a knock down configuration.
3. Provide hairline butt joint appearance.
h. Reinforcements.
1. ¼" thick pultruded FRP chemically welded to frame at all hinge, strike, and closer locations.
i. Hardware
1. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
j. Anchors:
1. Masonry.
a. Existing concrete or block punch and dimple.
b. Sill anchor.
c. Concealed existing masonry anchor.
d. Fiberglass masonry t anchor.
2. Drywall.
a. Standard jamb anchor tuck.

b. KD wrap.
c. Optional punch and dimple tuck with either metal or wood studs.

2.04 PERFORMANCE

A. Face Sheet.
1. Standard Interior and Exterior Class C 0.090" thick, smooth texture, painted FRP sheet.
a. Flexural Strength, ASTM-D790: 14 x 10^3 psi.
b. Flexural Modulus, ASTM-D790: 0.4 x 10^6 psi.
c. Tensile Strength, ASTM-D638: 6 x 10^3 psi.
d. Tensile Modulus, ASTM-D638: 0.4 x 10^6 psi.
e. Barcol Hardness, ASTM-D2583: 35.
f. Izod Impact, ASTM-D256: 5.0 ft-lb/in.
g. Water Absorption, ASTM-D570: 0.16%/24hrs at 77°F.
h. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
i. Meets USDA/ FSIS requirements.
j. GreenGuard Certified.

B. Stiles & Rails.
1. Fastener Withdrawal, ASTM-D1761: 894 lbs.

C. AF-150 Framing.
1. Tensile Strength, ASTM-D638: 15,900 psi.
2. Tensile Modulus of Elasticity, ASTM-D638: 1.58 x 10^6 psi.
3. Maximum Compressive Strength, ASTM-D695: 15,500 psi.
4. Compressive Modulus of Elasticity, ASTM-D695: 6.7 x 10^5 psi.
5. Flexural Strength, ASTM-D790: 39.3 x 10^3 psi.
6. Flexural Modulus, ASTM-D790: 1.23 x 10^6 psi.
7. Izod Impact, ASTM-D256: 8.1 ft-lb/in.
8. Barcol Hardness, ASTM-D2583: 57.
9. Specific Gravity, ASTM-D792: 1.45 @ 23 °C.
10. Density, ASTM-D792: 1445.6 kg.m^3 @ 23 °C.
11. Coefficient of Linear Expansion, ASTM-D696: 1.26 x 10^{-5} in/in/°F.
12. Short Beam Strength, ASTM-D2344: 3,980 psi.
13. Fastener Withdrawal, ASTM-D1761: 924 lbs.
14. Percent Fiberglass: 60%.

D. Door and AF-150 Frame Assembly.
1. PP Polypropylene Honeycomb Core.
a. Thermal Transmittance, NFRC 100.
1. Opaque Swinging Door (< than 50% glass)
a. U-Factor = 0.26 Btu/hr·ft²·°F.
2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
a. U-Factor = 0.44 Btu/hr·ft²·°F.
b. Air Leakage, NFRC 400, ASTM-E283.
1. Opaque Swinging Door (< than 50% glass)
a. 0.00 cfm/sqft @ 1.57 psf.
b. 0.00 cfm/sqft @ 6.24 psf.
2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
a. 0.04 cfm/sqft @ 1.57 psf.
b. 0.05 cfm/sqft @ 6.24 psf.
c. STC and OITC, ASTM-E90: STC = 31, OITC = 26.
2. Expanded Polystyrene Core.
a. Thermal Transmittance, NFRC 100.
1. Opaque Swinging Door (< than 50% glass)
a. U-Factor = 0.24 Btu/hr·ft²·°F.

2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
    a. U-Factor = 0.43 Btu/hr·ft²·°F.
b. Air Leakage, NFRC 400, ASTM-E283.
    1. Opaque Swinging Door (< than 50% glass)
        a. 0.02 cfm/sqft @ 1.57 psf.
        b. 0.06 cfm/sqft @ 6.24 psf.
    2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
        a. 0.30 cfm/sqft @ 1.57 psf.
        b. 0.53 cfm/sqft @ 6.24 psf.
c. STC and OITC, ASTM-E90: STC = 30, OITC = 30.

2.05 MATERIALS

A. Fiberglass.
    1. Face Sheet.
        a. See 2.04.A.
    2. Stiles & Rails.
        a. See 2.04.B.
    3. Framing
        a. See 2.04.C.
B. Fasteners.
    1. All exposed fasteners will have a finish to match material being fastened.
    2. 410 stainless steel or other non-corrosive metal.
    3. Must be compatible with items being fastened.

2.06 FABRICATION

A. Factory Assembly.
    1. Door and frame components from the same manufacturer.
    2. Required size for door and frame units, shall be as indicated on the drawings.
    3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
    4. All cut edges to be free of burs.
    5. Electrical arc welding of doors or frames is not acceptable.
    6. Maintain continuity of line and accurate relation of planes and angles.
    7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.
B. Shop Fabrication
    1. All shop fabrication to be completed in accordance with manufactures process work instructions.
    2. Quality control to be performed before leaving each department.

2.07 FINISHES

A. Door.
    1. FRP Face Sheets
        a. Two-part aliphatic polyurethane paint.
            1. Color. TBD
                a. Choose an item.
            2. Custom colors available consult manufacturer.
            3. Unique, high-solids, high-build, multifunctional coating.
            4. Low VOC, high-gloss, self-priming coating.
            5. Impact Resistance, ASTM-D2794: 140 in·lbs (direct), 50 in·lbs (reverse) @ 5 mils thickness.
            6. Taber Abrasion, 1 kg load, 1000 cycles, CS-17 wheel: 60.2 mg.
            7. Graffiti cleaning with Amerase with gloss retention: 100 cycles.
            8. Chemical Resistance.
                a. Excellent.
                    1. Acidic.

2. Alkaline.
3. Salt Solutions.
4. Seawater.
5. Fresh Water.
6. Petroleum Products.

B. Frame

1. Fiberglass.
   a. Two-part aliphatic polyurethane paint.
      1. Color. TBD
         a. Choose an item.
      2. Custom colors available consult manufacturer.
      3. Unique, high-solids, high-build, multifunctional coating.
      4. Low VOC, high-gloss, self-priming coating.
      5. Impact Resistance, ASTM-D2794: 140 in·lbs (direct), 50 in·lbs (reverse) @ 5 mils thickness.
      6. Taber Abrasion, 1 kg load, 1000 cycles, CS-17 wheel: 60.2 mg.
      7. Graffiti cleaning with Amerase with gloss retention: 100 cycles.
      8. Chemical Resistance.
         a. Excellent.
            1. Acidic.
            2. Alkaline.
            3. Salt Solutions.
            4. Seawater.
            5. Fresh Water.
            6. Petroleum Products.

2.08 ACCESSORIES

A. Vision Lites.
   1. Model.
      a. All Fiberglass.
   2. Size.
      a. Custom Size, see drawings for size.
   3. Glazing Thickness.
      a. 1/4".

B. Louvers.
   1. Size.
      a. None.
   2. Factory installed.
   3. Exterior side of louver shall be free of fasteners.
   4. Pultruded fiberglass.
   5. Finish to match door.

C. Hardware.
   1. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
   2. Hardware Schedule.
      a. As specified in Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Examine areas to receive doors.
- B. Notify architect of conditions that would adversely affect installation or subsequent use.
- C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION
- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION
- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- E. Set thresholds in bed of mastic and back seal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL
- A. Manufacture's Field Services.
  1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING
- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING
- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION
- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 08 17 43.1
FRP/ ALUMINUM HYBRID DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door.
B. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Aluminum Framing.
C. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.
D. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Retrofit Aluminum Framing.

1.02 RELATED SECTIONS

A. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
B. Section 08 06 71 – Door Hardware Schedule.
C. Section 08 06 80 – Glazing Schedule.
D. Section 08 10 00 – Doors and Frames.
E. Section 08 12 16 – Aluminum Frames.
F. Section 08 42 13 – Aluminum-Framed Entrances.
G. Section 08 71 00 – Door Hardware.
H. Section 08 91 26 – Door Louvers.

1.03 REFRENCES

A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
B. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
C. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
D. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
E. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
F. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
G. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
H. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
I. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
J. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
K. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
L. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
M. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
N. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
O. ASTM-D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
P. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
Q. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
R. ASTM-E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
S. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
T. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.
U. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.
V. TAS 201 – Impact Test Procedures.

W. TAS 202 – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
X. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.04 SUBMITTALS

A. Must comply with Section 01 33 00 – Submittal Procedures.
B. Action Submittals/ Informational Submittals.
    1. Product Data.
        a. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
    2. Shop Drawings.
        a. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
    3. Samples.
        a. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
        b. Submit manufacturer's sample of standard colors for door face and frame.
    4. Testing and Evaluation Reports.
        a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.
    5. Manufacturer Reports.
        a. Manufacturer's Project References.
            1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
C. Closeout Submittals.
    1. Operation and Maintenance Manual.
        a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
    2. Warranty Documentation.
        a. Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications.
    1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
    2. Door and frame components must be fabricated by same manufacturer.
    3. Evidence of a documented complaint resolution quality management system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery.
    1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
    2. Labels clearly identifying opening, door mark, and manufacturer.
B. Storage.
    1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
C. Handling.
    1. Protect materials and finish from damage during handling and installation.

1.07 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
B. Standard Period.
    1. Ten years starting on date of shipment.

C. Limited lifetime
   1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.

D. Finish
   1. Kynar painted aluminum: 10 years.
   2. Painted SL-17, SL-18, SL-19, SL-20 face sheets: 5 years.
   3. Painted AF-100, AF-200, AF-150 frames, AF-250 frames: 3 years.
   4. Painted FR doors: 3 years.
   5. Stained SL-18 and SL-9 face sheets: 5 years.
   6. Anodized, aluminum:10 years.
   7. Thresholds do not have a finish warranty.

PART 2 PRODUCTS

2.01 FRP/ALUMINUM HYBRID DOORS

A. Manufacturer.
   1. Special-Lite, Inc.
      a. PO Box 6, Decatur, Michigan 49045.
      b. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
      c. Web Site www.special-lite.com.
      d. E-Mail info@special-lite.com.

2.02 DESCRIPTION

A. Model.
   1. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door.

B. Door Opening Size.
   1. Per Door Schedule

C. Construction.
   1. Door Thickness.
      a. 1-3/4".
   2. Stiles & Rails.
      a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
      b. Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
      c. Screw or snap in place applied caps are not acceptable.
      d. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
      e. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.
      f. Meeting stiles to include integral pocket to accept pile brush weather seal.
   3. Corners.
      a. Mitered.
      b. Secured with 3/8" diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
      c. 1-1/4" x 1-1/4" x 3/16" 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.
      d. Weld, glue, or other methods of corner joinery are not acceptable.
   4. Core.
      a. Poured-in-place polyurethane foam.
      b. Laid in foam cores are not acceptable.
      c. Foam Plastic Insulated Doors: IBC 2603.4.
         1. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
         2. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.

3. IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032" aluminum or 0.016" steel.
4. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.

5. Face Sheet.
   a. Exterior
      1. 0.120" thick, Sandstone texture, through color FRP sheet.
      2. Optional painted finish consult manufacturer.
      3. Class C standard.
   b. Interior
      1. 0.120" thick, Sandstone texture, through color FRP sheet.
      2. Optional painted finish consult manufacturer.
      3. Class C standard optional Class A available consult manufacturer.
   c. Attachment of face sheet.
      1. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
      2. Use of glue to bond face sheet to core or extrusions is not acceptable.
6. Cutouts.
   a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
7. Hardware.
   a. Pre-machine doors in accordance with templates from specified hardware manufacturers.
   b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   c. Factory install door hardware.
8. Reinforcements.
   a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
   b. Sheet and plate to conform to ASTM-B209.
   c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
   d. Bars and tubes to meet ASTM-B221.

2.03 FRAMING

A. Framing
   1. Aluminum Tube Framing with Applied Stops.
      a. Model.
         1. SL-250.
      b. Materials.
         1. See 2.05.A.
      c. Perimeter Frame Members.
         1. Box type with 4 enclosed sides.
         2. Factory fabricated.
         3. Open-back framing is not acceptable.
      d. Applied Door Stops.
         1. 5/8" x 1-1/4" or 5/8" x 1-3/4", 0.125" wall thickness, with screws and weather-stripping.
         2. Provide solid ½" aluminum bar behind door stop for closer shoe attachment.
         3. Pressure gasketing for weathering seal.
         4. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
      e. Caulking.
         1. Caulk joints before assembling frame members.
      f. Frame Member to Member Connections.
         1. Secure joints with fasteners.
         2. Provide hairline butt joint appearance.

g. Hardware
   1. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
   2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   3. Factory install door hardware.

h. Anchors:
   1. Anchors appropriate for wall conditions to anchor framing to wall materials.
   2. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
   3. Secure head and sill members of transom, side lites, and similar conditions.

2.04 PERFORMANCE

A. Face Sheet.

1. Standard Interior and Exterior Class C 0.120" thick, Sandstone texture, through color FRP sheet.
   a. Flexural Strength, ASTM-D790: 27 x 10^3 psi.
   b. Flexural Modulus, ASTM-D790: 0.7 x 10^6 psi.
   c. Tensile Strength, ASTM-D638: 18 x 10^3 psi.
   d. Tensile Modulus, ASTM-D638: 1.0 x 10^6 psi.
   e. Barcol Hardness, ASTM-D2583: 40.
   f. Izod Impact, ASTM-D256: 7.0 ft-lb/in.
   g. Gardner Impact Strength, ASTM-D5420: 30 in-lb.
   h. Water Absorption, ASTM-D570: 0.16%/24hrs at 77°F.
   i. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
   j. Chemical Resistance.
      1. Excellent Rating.
         a. Acetic Acid, Concentrated.
         b. Acetic Acid, 5%.
         c. Bleach Solution.
         d. Detergent Solution.
         e. Distilled Water.
         f. Ethyl Acetate.
         g. Formaldehyde.
         h. Heptane.
         i. Hydrochloric Acid, 10%.
         j. Hydrogen Peroxide, 3%.
         k. Isooctane.
         l. Lactic Acid, 10%.
   k. USDA/FSIS Requirements.
      1. FRP face sheet with surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
      2. FRP face sheet with surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.
2. Optional Interior Face Only Class A 0.120" thick, Sandstone texture, through color FRP sheet.
   a. Flexural Strength, ASTM-D790: 14 x 10^3 psi.
   b. Flexural Modulus, ASTM-D790: 0.4 x 10^6 psi.
   c. Tensile Strength, ASTM-D638: 7 x 10^3 psi.
   d. Tensile Modulus, ASTM-D638: 0.8 x 10^6 psi.
   e. Barcol Hardness, ASTM-D2583: 45.
   f. Izod Impact, ASTM-D256: 4.0 ft-lb/in notched.
   g. Water Absorption, ASTM-D570: 0.16%/24hrs at 77°F.
   h. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450.
   i. Taber Abrasion Resistance, Taber Test: 0.036% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

B. Door Core.
   1. Density, ASTM-D1622: ≤ 5.0 pcf.
   2. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.
   3. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3" x 3" FRP Facers ≥ 53 psi, Tensile Adhesion, 1" x 1" Foam ≥ 104 psi.
   4. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days ≤ 13%.
   5. Thermal Conductivity, ASTM-C518, Thermal Resistance ≥ 0.10 m^2K/W.

C. Door Panel.
   1. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

D. Door and Aluminum Tube Frame Assembly.
   1. Structural Performance, ASTM E-330.
      a. Single or Pair of Doors, 6'4" x 7'2" overall size, single point latching.
         1. ± 90 psf design pressure, pass.

2.05 MATERIALS

A. Aluminum Members.
   1. Aluminum extrusions made 6061 or 6063 aluminum alloys.
   2. Sheet and plate to conform to ASTM-B209.
   3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

B. Fiberglass.
   1. See 2.02.C.5.

C. Fasteners.
   1. All exposed fasteners will have a finish to match material being fastened.
   2. 410 stainless steel or other non-corrosive metal.
   3. Must be compatible with items being fastened.

2.06 FABRICATION

A. Factory Assembly.
   1. Door and frame components from the same manufacturer.
   2. Required size for door and frame units, shall be as indicated on the drawings.
   3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
   4. All cut edges to be free of burs.
   5. Welding of doors or frames is not acceptable.
   6. Maintain continuity of line and accurate relation of planes and angles.
   7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication
   1. All shop fabrication to be completed in accordance with manufactures process work instructions.
   2. Quality control to be performed before leaving each department.

2.07 FINISHES

A. Door.
   1. Aluminum.
      a. Mill.
         1. AA-M10C22A21-Flash.
      b. Anodizing.
         1. Class 1 Anodizing, minimum 0.7 mils thick.
            a. Color.
               1. Clear 215 R1, AA-M10C12C22A41.
   2. FRP Face Sheets
      a. Through color.
         1. Color.TBD
            a. Choose an item.

b. Painted.
1. Color.TBD
a. Choose an item.
2. Custom colors available consult manufacturer.

B. Frame

1. Aluminum.
a. Mill.
1. AA-M10C22A21-Flash.
b. Anodizing.
1. Class 1 Anodizing, minimum 0.7 mils thick.
a. Color.
1. Clear 215 R1, AA-M10C12C22A41.
2. Impact Resistance, ASTM-D2794: 140 in·lbs (direct), 50 in·lbs (reverse) @ 5 mils thickness.
3. Taber Abrasion, 1 kg load, 1000 cycles, CS-17 wheel: 60.2 mg.
4. Graffiti cleaning with Amerase with gloss retention: 100 cycles.
5. Chemical Resistance.
a. Excellent.
1. Acidic.
2. Alkaline.
3. Salt Solutions.
4. Seawater.
5. Fresh Water.
6. Petroleum Products.

2.08 ACCESSORIES

A. Vision Lites.
B. Hardware.
1. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
2. Factory install hardware.
3. Hardware Schedule.
a. As specified in Section 08 71 00.
1. Concealed adjustable bottom brush.
a. SL-301.
1. Not for use with CVR type hardware.
2. Concealed adjustable meeting stile astragal.

PART 3 EXECUTION

3.01 EXAMINATION
A. Examine areas to receive doors.
B. Notify architect of conditions that would adversely affect installation or subsequent use.
C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION
A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION
A. Install doors in accordance with manufacturer's instructions.
B. Install doors plumb, level, square, true to line, and without warp or rack.
C. Anchor frames securely in place.
D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
E. Set thresholds in bed of mastic and back seal.
F. Install exterior doors to be weathertight in closed position.
G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.

H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL

A. Manufacture's Field Services.
   1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.
B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 08 33 00
OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Overhead Coiling Counter Doors

1.3 RELATED SECTIONS

A. Section 05 10 00 - Structural Metal Framing.

B. Section 06 10 00 - Rough Carpentry.

C. Section 09 90 00 - Painting and Coating.

D. Section 26 05 00 - Common Work Results for Electrical.

1.4 REFERENCES

A. ASTM A480/A480M-04; 2004 - Standard Specification for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

B. ASTM A653/A653M-03; 2003 - Standard Specification for Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A666-00; 2000 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM B209-04; 2004 - Standard Specification for Aluminum - Alloy Sheet and Plate.

E. ASTM B221-02; 2002 - Standard Specification for Aluminum - Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

F. National Fire Protection Association NFPA 80, 2013 Edition - Standard for Fire Doors and Fire Windows.

G. Underwriters Laboratories (UL) 10B, 1997 Edition - Standard for Fire Tests of Door Assemblies.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

3. Include description of automatic closing device and testing and resetting instructions.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details
   2. Include details of equipment assemblies and indicate dimensions, required clearances, and components.
   3. Provide BIM models upon request.
   4. Show controls, locking devices, [detectors] [fusible links], and other accessories.

D. Samples for Initial Selection: Upon request, provide manufacturer's finish charts showing full range of colors and textures available for units with factory applied finishes.
   1. Include similar samples of accessories involving color selection

E. Samples for Verification: Upon request, provide for each type of exposed finish on the following components in manufacturer's standard sizes.
   1. Curtain slats.
   2. Bottom bar.

I. Closeout Submittals:
   1. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company specializing in the manufacturing of products specified in this section and with a minimum of five years experience.

B. Installer Qualifications: Installer shall be authorized and qualified to install overhead door systems on the type and scope of project specified.
   1. Maintenance Proximity: Not more than [insert number] hours normal travel time from installers place of business to project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of all materials in accordance with federal, state and local laws.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer's warranty that all parts and components are to be free from defects in materials and workmanship for 1 year.

B. Warranty: Manufacturer's warranty that all parts and components, except counterbalance spring and finish, are to be free from defects in materials and workmanship for 5 years. Counterbalance springs to be warrantied for 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: C.H.I. Overhead Doors, which is located at: 1485 Sunrise Dr. ; Arthur, IL 61911; Toll Free Tel: 800-590-0559; Fax: 217-543-4454; Email: AIA@chiohd.com; Web: www.chiohd.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Overhead Coiling Counter Doors

1. Seismic Performance: Overhead coiling doors shall be evaluated for seismic performance to withstand the effect of earthquake motions determined according to ASCE/SEI 7.
2. Operation: Design complete door assembly including operator for usage of up to 20 cycles per day.

B. Source Limitations: Provide overhead coiling doors from one manufacturer for each type of door. Provide operators and other accessories from source acceptable to overhead coiling door manufacturer.

2.3 MATERIALS

A. Galvanized Steel Sheet:

1. Galvanized commercial steel, (CS type) per ASTM A653/A653M, G90 and G60 coating class.

B. Stainless Steel Sheet: ASTM A480/A480M or ASTM A666; Type 304, roll form temper.

C. Aluminum:

1. Extrusions: ASTM B221, alloy and temper best suited to application.
2. Sheet: ASTM B209, alloy and temper best suited to application.

2.4 DOOR ASSEMBLY

A. Overhead Coiling Counter Doors

1. Basis of Design: C.H.I. Overhead Doors model 6566.
2. Construction:
    a. Curtain: Constructed from interlocking slats formed from the following.
        1) Material:
            a) 22 gauge stainless steel
                i) Finish:
                    a. #4 stainless steel
        2) Profile:
            a) Flat, non-insulated, 1-1/2 inches high by 1/2 inch deep.
        3) End locks: Nylon, attached to every other slat to act as wearing surface and prevent lateral movement.
        4) Bottom bar:
            a) Extruded aluminum tube type bottom bar.
                i) Bottom Bar Finish
                    a. Clear Anodized Aluminum
                    b. Powder Coat [RAL#] [to match curtain]
            b) Stainless steel angle bolted to curtain, with adjustable tubular compression weather seal.
                i) Bottom Bar Finish:
                    a. #4 stainless steel
    b. Guides: Two piece, box shaped guides [and pack out angle]
        1) Guide Material:
            a) Aluminum
                i) Guide Finish:
                    a. Clear Anodized Aluminum
                    b. Powder Coat [RAL#] [to match curtain]
            b) Stainless Steel
                i) Guide Finish: Mill finish
    c. Head Plate: Rectangular steel plate, with precision sealed ball bearings supporting drive side axle.
    d. Barrel Assembly: Steel pipe sized for maximum deflection under full load not to exceed 0.03” per foot of span with threaded rings or lugs welded to barrel assembly for curtain attachment.
    e. Springs: Spring tension assembly supported within barrel by precision ball bearings. Curtain weight counterbalanced by oil tempered, helically wound torsion springs; grease packed and mounted on steel torsion shafts with cast spring plug.
        1) Designed for usage up to 20 cycles per day.
    f. Hood: Shaped to fit within the head plates and with intermediate supports as required.
        1) Hood Material:
            a) Minimum 24 gauge galvanized steel
                i) Hood finish:

a. Match curtain finish
b. Polyester Finish: [Gray], [White], [Tan], [Brown], [Galvanized]
c. Powder Coat: [RAL#] [to match curtain]

b) Minimum 20 gauge (.032) Aluminum.

i) Hood finish:

a. Clear Anodized.
b. Powder Coat: [RAL#] [to match curtain]

c) Minimum 24 gauge stainless steel

i) Hood finish:

a. #4 polished stainless steel

2) Provide head plate covers to match hood.

g. Weather Seal:

1) Tubular vinyl bottom seal

h. Locking Mechanism:

1) Cylinder lock.

a) Keyed opposite coil side of door with thumb turn on coil side.
b) Keyed on both sides of the door.

2) Steel slide bolt locks with padlock provisions.
3) Interlock Switches: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

3. Mounting:

a. Face of wall and above lintel.
b. Face of wall and under lintel.
c. Between jamb and above lintel.
d. Between jamb and under lintel.

4. Manual Operation

a. Manual push up.
b. Awning crank.

5. Electric Motor Operator: Provide operator unit, UL listed and UL labeled, size as recommended by manufacturer, capable of driving door at a speed of no less than 8 inches per second nor more than 12 inches per second.

a. Operator Location:

1) Internally mounted in barrel.
2) Externally mounted on drive side of shutter.

b. Power Supply:

1) 115 VAC, single phase

c. Control Station:

1) 24 V three button control station with open, close, and stop buttons
2) 24 V three button control station with open, close, and stop buttons and keyed lockout.
3) 24 V key control station with open and close contacts.

4) 24 V key control station with open/close contacts and stop button.
   a) NEMA 1 Surface mounted for interior.
   b) NEMA 1 Flush mounted for interior.
   c) NEMA 4 Surface mounted for exterior.
   d) NEMA 4 Flush mounted for exterior.

PART 2 EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for substrate construction and other conditions affecting performance of the work.
B. Examine locations of electrical connections.
C. Proceed with installation only after all unsatisfactory conditions have been corrected.

2.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Anchor to adjacent construction without distortion or stress.
C. Fit and align door and shutter assembly including hardware, plumb, level and square to ensure smooth operation.
D. Complete wiring from operator to controls and components.
E. Coordinate installation of electrical service from power supply to operator.
F. Complete wiring from operator to controls and components.
G. Coordinate installation of electrical service from power supply to operator.

2.3 ADJUSTING

A. Adjust hardware and moving parts so that doors operate smoothly throughout full operating range.
B. Adjust seals to provide a tight fit around the entire perimeter.

2.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include [three] [six] [nine] [twelve] months full maintenance by skilled employees of installing company. Include [monthly] [quarterly] preventive maintenance, repair or replace of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer’s authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24 hour per day, seven days per week, emergency callback service.

3.5 DEMONSTRATION

A. Demonstrate proper operation to Owner.
B. Perform fire door and shutter drop tests in presence of Owner or owner's representative. Require signature for manufacturer supplied drop test form.

END OF SECTION

SECTION 08 33 00- 1
OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Insulated Overhead Coiling Service Doors

1.3 RELATED SECTIONS

A. Section 05 10 00 - Structural Metal Framing.

B. Section 06 10 00 - Rough Carpentry.

C. Section 09 90 00 - Painting and Coating.

D. Section 26 05 00 - Common Work Results for Electrical.

1.4 REFERENCES

A. ASTM A480/A480M-04; 2004 - Standard Specification for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

B. ASTM A653/A653M-03; 2003 - Standard Specification for Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic closing device and testing and resetting instructions.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer’s product data.

1. Include plans, elevations, sections, and mounting details
2. Include details of equipment assemblies and indicate dimensions, required clearances, and components.
3. Provide BIM models upon request.
4. Show controls, locking devices, [detectors] [fusible links], and other accessories.

D. Samples for Initial Selection: Upon request, provide manufacturer's finish charts showing full range of colors and textures available for units with factory applied finishes.
   1. Include similar samples of accessories involving color selection

E. Samples for Verification: Upon request, provide for each type of exposed finish on the following components in manufacturer's standard sizes.
   1. Curtain slats.
   2. Bottom bar.

F. Closeout Submittals:
   1. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company specializing in the manufacturing of products specified in this section and with a minimum of five years experience.

B. Installer Qualifications: Installer shall be authorized and qualified to install overhead door systems on the type and scope of project specified.
   1. Maintenance Proximity: Not more than [insert number] hours normal travel time from installers place of business to project site.

C. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value of 25.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of all materials in accordance with federal, state and local laws.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer's warranty that all parts and components are to be free from defects in materials and workmanship for 1 year.

B. Warranty: Manufacturer's warranty that all parts and components, except counterbalance spring and finish, are to be free from defects in materials and workmanship for 5 years. Counterbalance springs to be warrantied for 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: C.H.I. Overhead Doors, which is located at: 1485 Sunrise Dr.; Arthur, IL 61911; Toll Free Tel: 800-590-0559; Fax: 217-543-4454; Email: AIA@chiohd.com; Web: www.chiohd.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Insulated Overhead Coiling Service Doors

1. Wind Loads: Design door assembly to withstand a minimum of 20 psf in accordance with ASTM E330 using a 1.0 factor of safety.
2. Seismic Performance: Overhead coiling doors shall be evaluated for seismic performance to withstand the effect of earthquake motions determined according to ASCE/SEI 7.
3. Operation: Design complete door assembly including operator for use of not less than [20,000] [50,000] [100,000] cycles

B. Source Limitations: Provide overhead coiling doors from one manufacturer for each type of door. Provide operators and other accessories from source acceptable to overhead coiling door manufacturer.

2.3 MATERIALS

A. Galvanized Steel Sheet:

1. Galvanized commercial steel, (CS type) per ASTM A653/A653M, G90 and G60 coating class.

2.4 DOOR ASSEMBLY

A. Insulated Overhead Coiing Service Doors

1. Basis of Design: C.H.I. Overhead Doors model 6222.

2. Construction:
   a. Curtain: Constructed from interlocking slats formed from the following.
      1) Front Slat Material:
         a) 22 gauge galvanized steel.
            i) Finish: Hot-dipped galvanized in accordance with ASTM A653 and with baked on enamel primer coat and polyester finish coat.
               a. Polyester Finish: [Gray], [White], [Tan] [Brown] [Galvanized]
               b. Powder Coat: [RAL#] [Custom Color Match]

2) Back Slat Material:
   a) 24 gauge galvanized steel.
      i) Finish: Hot-dipped galvanized in accordance with ASTM A653 and with baked on enamel primer coat and polyester finish coat.
         a. Polyester Finish: [Gray], [White], [Tan], [Brown], [Galvanized]
         b. Powder Coat: [RAL#] [Custom Color Match]
3) Insulation:
   a) Fill slats with CFC free foamed-in-place polyurethane insulation board complying with maximum flame spread and smoke developed indexes of 75 and 450 respectively, according to ASTM E84 or UL 723.
4) Profile:
   a) Flat, insulated, 2-3/4 inches high by 5/8 inch deep.
5) End locks: Galvanized malleable iron, attached to every other slat to act as wearing surface and prevent lateral movement.
6) Wind locks: Per design and wind load requirements
7) Bottom bar:
   a) Two steel angles bolted back-to-back, with adjustable tubular compression weather seal.
      i) Bottom Bar Finish:
         a. Painted Black
         b. Hot Dipped Galvanized
         c. Cold Galvanizing
         d. Powder Coat [RAL#] [to match curtain]
   b) Extruded aluminum tube type bottom bar.
      i) Bottom Bar Finish
         a. Clear Anodized Aluminum
         b. Powder Coat [RAL#] [to match curtain]
8) Vision Lites: Provide rectangular lites, approximately 5 inches wide by 1-1/8 inch high, spaced 7 inches on center, and with clear acrylic glazing.
   a) Pattern: [As shown on drawings] [[ ] lites wide by [ ] lites high] at [ ] feet above finished floor.

b. Guides: Structural angles bolted together to form guide and mounting surface.
   1) Guide Material:
      a) Steel
         i) Guide Finish:
            a. Painted Black
            b. Hot Dipped Galvanized
            c. Cold Galvanizing
            d. Powder Coat [RAL#] [to match curtain]

c. Head Plate: Rectangular steel plate, with precision sealed ball bearings supporting drive side axle.

d. Barrel Assembly: Steel pipe sized for maximum deflection under full load not to exceed 0.03" per foot of span with threaded rings or lugs welded to barrel assembly for curtain attachment.

e. Springs: Spring tension assembly supported within barrel by precision ball bearings. Curtain weight counterbalanced by oil tempered, helically wound torsion springs; grease packed and mounted on steel torsion shafts with cast spring plug.
   1) Designed for minimum 20,000 cycles.
   2) Designed for minimum 50,000 cycles.
   3) Designed for minimum 100,000 cycles.

f. Hood: Shaped to fit within the head plates and with intermediate supports as required.
   1) Hood Material:
      a) Minimum 24 gauge galvanized steel
   2) Hood Color:
      a) Match curtain finish
      b) Polyester Finish: [Gray], [White], [Tan], [Brown], [Galvanized]
      c) Powder Coat: [RAL#] [to match curtain]

g. Weather Seal:
   1) Tubular vinyl bottom seal
   2) Vinyl guide seal with rubber hood baffle.
   3) Guide brush seal.
   4) Header brush seal.

h. Locking Mechanism:
   1) Two plated steel slide bolt locks with padlock provisions.
   2) Chain keeper suitable for padlocking.
   3) Cylinder lock mounted to double angle bottom bar.
      a) Keyed on exterior of door with thumb turn on interior.
      b) Keyed on both sides of the door.
   4) Extruded aluminum tube type bottom bar with cylinder locking.
      a) Keyed on exterior of door with handle throw on interior.
      b) Keyed on both sides of the door.
   5) Interlock Switches: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

3. Mounting:
   a. Face of wall and above lintel.
   b. Face of wall and under lintel.
   c. Between jamb and above lintel.
   d. Between jamb and under lintel.

4. Manual Operation

a. Chain Hoist.

5. Electric Motor Operator: Provide operator unit, UL listed and UL labeled, size as recommended by manufacturer, capable of driving door at a speed of no less than 8 inches per second nor more than 12 inches per second.
   a. Usage Classification
      1) Heavy duty; 25 or more cycles per hour and over 90 cycles per day.
      2) Standard duty; up to 25 cycles per hour and up to 90 cycles per day.
      3) Medium duty; up to 12 cycles per hour and up to 50 cycles per day.
      4) Light duty; up to 10 cycles per hour.
   b. Operator Location:
      1) Mounted on front of hood.
      2) Wall mounted.
      3) Mounted on opposite side of the wall with connection through wall.
      4) As shown on drawings.
   c. Operator Exposure:
      1) Interior.
      2) Exterior; wet and humid.
         a) Provide operator cover to protect operator from weather.
            i) Operator cover finish to match hood.
            ii) Operator cover to be galvanized finish.
   d. Power Supply:
      1) 115 VAC, single phase
      2) 230 VAC, single phase
      3) 208/230 VAC, three phase
      4) 460 VAC, three phase
      5) 575 VAC, three phase
   e. Control Station:
      1) 24 V three button control station with open, close, and stop buttons
      2) 24 V three button control station with open, close, and stop buttons and keyed lockout.
      3) 24 V key control station with open and close contacts.
      4) 24 V key control station with open/close contacts and stop button.
         a) NEMA 1 Surface mounted for interior.
         b) NEMA 1 Flush mounted for interior.
         c) NEMA 4 Surface mounted for exterior.
         d) NEMA 4 Flush mounted for exterior.
   f. Remote Controls:
      1) Provide radio receiver and [single] [three] button remote control(s).
         a) Provide […..] transmitters.
         b) Program remote controls to Open/ Close/ Stop the door.
   g. Special Controls:
      1) Keypad Entry System.

a) Mounting post.

2) Card Reader System.

a) Mounting post.

3) Internet Connectivity

4) Door Timer.

5) Loop Detector.

6) Pull Cord.

7) Vehicle Detector.

h. Primary Entrapment Protection Devices

1) NEMA 1 Monitored Photo Sensors: Photo eyes fully monitored, non-contact, infrared beam photo sensor system shall reverse a closing door to the full open position when an obstruction is sensed; photo sensors shall be mounted no higher than 6 inches (152 mm) maximum above the floor.

2) NEMA 4 Monitored Photo Sensors: Photo eyes fully monitored, non-contact, photo beam reversing photo sensor system with NEMA 4 watertight enclosure shall reverse a closing door to the full open position when an obstruction is sensed; photo sensors shall be mounted no higher than 6 inches (152 mm) maximum above the floor.

3) Monitored Electric Sensing Edge: Electric sensing edge fully monitored and connected to the operator shall reverse a closing door to the full open position when an obstruction is sensed.

i. Ancillary Entrapment Protection Devices:

1) Non-Monitored Electric Sensing Edge: Non-monitored electric sensing edge shall reverse a closing door to the full open position when an obstruction is sensed.

2) Pneumatic Sensing Edge: Pneumatic sensing edge shall reverse a closing door to the full open position when an obstruction is sensed.

6. Wind load: Design door assembly to withstand a minimum of 20 psf in accordance with ASTM E330 using a 1.0 factor of safety.

PART 2 EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for substrate construction and other conditions affecting performance of the work.

B. Examine locations of electrical connections.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

2.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor to adjacent construction without distortion or stress.

C. Fit and align door and shutter assembly including hardware, plumb, level and square to

ensure smooth operation.

D. Complete wiring from operator to controls and components.

E. Coordinate installation of electrical service from power supply to operator.

F. Complete wiring from operator to controls and components.

G. Coordinate installation of electrical service from power supply to operator.

2.3 ADJUSTING

A. Adjust hardware and moving parts so that doors operate smoothly throughout full operating range.

B. Adjust seals to provide a tight fit around the entire perimeter.

2.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include [three] [six] [nine] [twelve] months full maintenance by skilled employees of installing company. Include [monthly] [quarterly] preventive maintenance, repair or replace of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer’s authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24 hour per day, seven days per week, emergency callback service.

3.5 DEMONSTRATION

A. Demonstrate proper operation to Owner.

B. Perform fire door and shutter drop tests in presence of Owner or owner's representative. Require signature for manufacturer supplied drop test form.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
5. Division 08 Section “Automatic Door Operators”.
6. Division 08 Section “Access Control Hardware”.
7. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Proof of Compliance: (California located Projects): Provide a list of product(s) containing chemicals known to cause cancer or reproductive toxicity as defined by the Office of Environmental Health Hazard Assessment (OEHHA) under Proposition 65 (CA Code of Regulations, Title 27, Section 27001). The list includes the specific chemical(s), if the chemical will be exposed to consumers, the means of warning, and an illustration of the label.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Five years for standard duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Ten years for manual surface door closer bodies.
4. Twenty five years for manual surface door closer bodies.
5. Five years for motorized electric latch retraction exit devices.
6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) – EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.

b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Manufacturer's Standard.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Manufacturers:

a. Yale Locks and Hardware (YA) - Keymark Series.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide construction master keyed cylinders.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).

c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Locks are to be non-handed and fully field reversible.

2. Manufacturers:

a. Yale Locks and Hardware (YA) 4700LN Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Yale Locks and Hardware (YA) – 7000 Series.

C. Security Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified rim panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be constructed of high grade, heat treated, corrosion resistant nickel steel alloy, and have a full 3/4" throw projection with slide action positive deadlocking.

1. Static Load Force Resistance: Minimum 3000 lbs certified independent tested.

2. Manufacturers:

    a. Yale Locks and Hardware (YA) - Squarebolt Series.

D. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.

3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Manufacturers:

a. Yale Locks and Hardware (YA) - M200 Series.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 281 Series.

C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

a. Yale Locks and Hardware (YA) - 4400 Series.

2.10 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Door Controls (NO) - 6000 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.14 ELECTRONIC ACCESSORIES

A. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

1. Manufacturers:

a. Securitron (SU) - XMS Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

C. Switching Power Supplies: Provide switching power supplies that are dual voltage, UL listed, supervised units. Units shall be field selectable with a dedicated battery charging circuit that provide 4 Amp at 12VDC or 24VDC continuous, with up to 16 independently controlled power limited outputs. Units shall tolerate brownout or overvoltage input ± 15% of nominal voltage and have thermal shutdown protection with auto restart. Circuit breaker shall protect against overcurrent and reverse battery faults and units shall be available with a single relay fire trigger or individually triggered relayed outputs. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Manufacturers:

a. Securitron (SU) - AQ Series.

2.15 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to

operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Materials to be furnished in accordance to Premier/ASSA ABLOY GPO Contract #PP-FA-663.

D. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. YA - Yale
5. RF - Rixson
6. SA - SARGENT
7. NO - Norton
8. SU - Securitron
9. OT - OTHER

Hardware Sets

Set: 1.0

Doors: 101A
Description: Exterior Pair, Vestibule Entrance, AO

2	Continuous Hinge	CFM85SLI-HD1 PT		PE	087100	
1	Exit Device (CVR, exit only)	7120 EO ECK1	630	YA	087100	
1	Exit Device (nightlatch)	7120 603F P ECK1 K600		YA		
2	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100	
1	Conc Overhead Stop	6ADJ-X36	630	RF	087100	
1	Surface Closer (CPS)	4430	689	YA	087100	
1	Door Operator (Single)	6061	689	NO	087100	□
1	Threshold	253x3AFG		PE	087100	
1	Rain Guard	346C TKSP		PE	087100	
2	Sweep	345APK TKSP		PE	087100	
1	ElectroLynx Harness (frame)	QC-C_ (size as required)		MK	087100	□
1	ElectroLynx Harness (door)	QC-C_ (size as required)		MK	087100	□
1	Electric Power Transfer	EL-CEPT		SU	087100	□
1	Switch Post	500		NO	087100	□
1	Door Switch	501		NO	087100	□

Notes: Perimeter seal and astragal by door/frame provider.

Set: 1.1

Doors: 101B
Description: Exterior Pair, Vestibule Entrance

2	Continuous Hinge	CFM85SLI-HD1 PT		PE	087100
1	Exit Device (nightlatch)	7120 603F ECK1 K600		YA	
1	Exit Device (CVR, exit only)	7120 EO ECK1	630	YA	087100
2	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
2	Surface Closer (CPS)	4430	689	YA	087100
1	Threshold	253x3AFG		PE	087100
1	Rain Guard	346C TKSP		PE	087100
2	Sweep	345APK TKSP		PE	087100

Notes: Perimeter seal and astragal by door/frame provider.

Set: 2.0

Doors: 106B, 117B, 130A, 130B, 160A, 160B, 161A, 161B

Description: Exterior Pair, Corridor Exit

2	Continuous Hinge	CFM_SLI-HD1 (size as required)		PE	087100
1	Removable Mullion	KRM200	600	YA	087100
2	Exit Device (rim, exit only)	7150 EO ECK1	630	YA	087100
1	Cylinder	K6 Series	626	YA	087100
2	Surface Closer (CPS)	4430	689	YA	087100
2	Kick Plate	K1050 10" high x 1" LDW SA BEV	US32D	RO	
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
2	Sweep	345APK TKSP		PE	087100
2	Astragal	29310CP TKSP		PE	087100

Notes: Template closer and exit device for weatherstrip mounting. Install weatherstrip on frame prior to installing closer or exit device strike to provide a continuous seal.

Set: 3.0

Doors: 157C, 157B, 163B, 164

Description: Exterior Pair, Mech/Elect, Exit

6	Hinge (stainless heavy weight)	T4A3386 NRP (size as required)	US26D	MK	087100
1	Removable Mullion	KRM200	600	YA	087100
1	Exit Device (rim, exit only)	7150 EO ECK1	630	YA	087100
1	Exit Device (rim, nightlatch)	7150F MO627F K600 ECK1	630	YA	087100
1	Cylinder	K6 Series	626	YA	087100
2	Surface Closer (CPS)	4430	689	YA	087100
2	Kick Plate	K1050 10" high x 1" LDW SA BEV	US32D	RO	
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
2	Sweep	345APK TKSP		PE	087100
2	Astragal	29310CP TKSP		PE	087100

Notes: Template closer and exit device for weatherstrip mounting. Install weatherstrip on frame prior to installing closer or exit device strike to provide a continuous seal.

Set: 4.0

Doors: 143

Description: Exterior Single, Riser

3	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Surface Closer (CPS)	4430	689	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
1	Sweep	345APK TKSP		PE	087100

Notes: Template closer for weatherstrip mounting. Install weatherstrip on frame prior to installing closer to provide a continuous seal.

Set: 5.0

Doors: 166

Description: Exterior Single, Acid Room, SRI

3	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
1	Sweep	345APK TKSP		PE	087100

Notes: Template closer and for weatherstrip mounting. Install weatherstrip on frame prior to installing closer to provide a continuous seal.

Set: 6.0

Doors: 102B, 103A, 103B

Description: Interior Pair, Vestibule

2	Continuous Hinge	CFM_SLI-HD1 (size as required)		PE	087100
2	Door Pull	RM3300-24 Mtg-Type 12XHD	US32D	RO	087100

2	Push Bar	RM3102 Mtg-Type 12XHD	US32D	RO	087100
2	Surface Closer (CPS)	4430	689	YA	087100

Set: 6.1

Doors: 102A
Description: Interior Pair, Vestibule

2	Continuous Hinge	CFM_SLI-HD1 (size as required)		PE	087100
2	Door Pull	RM3300-24 Mtg-Type 12XHD	US32D	RO	087100
2	Push Bar	RM3102 Mtg-Type 12XHD	US32D	RO	087100
1	Conc Overhead Stop	6ADJ-X36	630	RF	087100
2	Surface Closer (CPS)	4430	689	YA	087100
1	Door Operator (Single)	6061	689	NO	087100
1	Door Switch	501		NO	087100
1	Door Switch (vestibule)	504		NO	087100

Set: 7.0

Doors: 103 D, 103C
Description: Interior Pair, Vestibule, SRI

2	Continuous Hinge	CFM_SLI-HD1 (size as required)		PE	087100
2	Door Pull	RM3300-24 Mtg-Type 12XHD	US32D	RO	087100
2	Push Bar	RM3102 Mtg-Type 12XHD	US32D	RO	087100
2	Door Closer	SRI 281 CPS	EN	SA	087100

Set: 8.0

Doors: 106A, 117A, 117C
Description: Interior Pair, Corridor, CR HO

6	Hinge (heavy weight)	T4A3786 NRP (size as required)	US26D	MK	087100
1	Removable Mullion	KRM200	600	YA	087100
1	Electric Exit Device (rim, fail secure)	7150 B S MO691F K620 ECK1	630	YA	087100
1	Exit Device (rim, exit only)	7150 EO ECK1	630	YA	087100
2	Surface Closer (CPSH)	4430T	689	YA	087100
2	Kick Plate	K1050 10" high x 1" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100
1	ElectroLynx Harness (frame)	QC-C_ (size as required)		MK	087100

1	ElectroLynx Harness (door)	QC-C_ (size as required)		MK 087100	
1	Electric Power Transfer	EL-CEPT		SU 087100	
1	Card Reader	Card Reader by Security		OT	
2	Position Switch	DPS-M-BK		SU 087100	
1	Power Supply	AQD		SU 087100	

Notes: Operation:
1. Door normally closed, latched and locked. Access is obtained from the secure side by valid credential or key override. In the event of power failure door mechanically locks.
2. Free egress from the interior by depressing inside push pad.
3. Request to exit switch in push pad signals authorized egress to the access control system.
4. Door position switch signals door/open closed to access control system.
5. Contact switch in latch mechanism ensures positive strike.

Set: 9.0

Doors: 105, 116, 132A, 132B, 137A

Description: Interior Single, Admin/Concession, CR

3	Hinge	TA2714 (size as required)	US26D	MK 087100	
1	Fail Secure Lock	MO 4791LN 497 K600	626	YA 087100	
1	Surface Closer	R4400	689	YA 087100	
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO 087100	
1	Wall Stop	406	US26D	RO 087100	
1	Gasketing	S88BL		PE 087100	
1	ElectroLynx Harness (frame)	QC-C_ (size as required)		MK 087100	
1	ElectroLynx Harness (door)	QC-C_ (size as required)		MK 087100	
1	Electric Power Transfer	EL-CEPT		SU 087100	
1	Card Reader	Card Reader by Security		OT	
1	Position Switch	DPS-M-BK		SU 087100	
1	Motion Sensor	XMS		SU 087100	
1	Power Supply	AQD		SU 087100	

Notes: Operation:
1. Door normally closed and locked. Access is obtained by valid credential or key override. Locksets mechanically lock during power failure.
2. Free egress from inside by depressing inside lever.
3. Door position switch to signal door open/closed to the access control system.
4. Motion sensor to signal authorized egress to the access control system.

Set: 10.0

Doors: 144, 159A, 168

Description: Interior Single, Pool, CR SRI

3	Hinge (stainless)	TA2314 (size as required)	US26D	MK 087100	
1	Fail Secure Lock	MO 4791LN 497 K600	626	YA 087100	□
1	Door Closer	SRI 281 O	EN	SA 087100	
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
1	Wall Stop	406	US26D	RO 087100	
3	Silencer	608-RKW		RO 087100	
1	ElectroLynx Harness (frame)	QC-C_ (size as required)		MK 087100	□
1	ElectroLynx Harness (door)	QC-C_ (size as required)		MK 087100	□
1	Electric Power Transfer	EL-CEPT		SU 087100	□
1	Card Reader	Card Reader by Security		OT	
1	Position Switch	DPS-M-BK		SU 087100	□
1	Motion Sensor	XMS		SU 087100	□
1	Power Supply	AQD		SU 087100	□

Notes: Operation:
1. Door normally closed and locked. Access is obtained by valid credential or key override. Locksets mechanically lock during power failure.
2. Free egress from inside by depressing inside lever.
3. Door position switch to signal door open/closed to the access control system.
4. Motion sensor to signal authorized egress to the access control system.

Set: 11.0

Doors: 142

Description: Interior Pair, Storage

6	Hinge	TA2714 NRP (size as required)	US26D	MK 087100	
2	Flush Bolt	555	US26D	RO 087100	
1	Dust Proof Strike	570	US26D	RO 087100	
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA 087100	
1	Surface Closer	PR4400	689	YA 087100	
2	Kick Plate	K1050 10" high x 1" LDW CSK BEV	US32D	RO 087100	
2	Wall Stop	406	US26D	RO 087100	
2	Astragal	29310CP TKSP		PE 087100	
2	Silencer	608-RKW		RO 087100	

Set: 12.0

Doors: 162A

Description: Exterior Pair, Mech

6	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
2	Flush Bolt	555	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Surface Closer (CPS)	4430	689	YA	087100
2	Kick Plate	K1050 10" high x 1" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	406	US26D	RO	087100
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
2	Sweep	345APK TKSP		PE	087100
2	Astragal	29310CP TKSP		PE	087100

Notes: Template closer for weatherstrip mounting. Install weatherstrip on frame prior to installing closer to provide a continuous seal.

Set: 13.0

Doors: 165

Description: Exterior Pair, Calcium Hypo, SRI

6	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
2	Flush Bolt	555	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
2	Kick Plate	K1050 10" high x 1" LDW SA BEV	US32D	RO	
1	Threshold	253x3AFG		PE	087100
1	Gasketing	2891APK		PE	087100
1	Rain Guard	346C TKSP		PE	087100
2	Sweep	345APK TKSP		PE	087100
2	Astragal	29310CP TKSP		PE	087100

Notes: Template closer for weatherstrip mounting. Install weatherstrip on frame prior to installing closer to provide a continuous seal.

Set: 14.0

Doors: 167
Description: Interior Pair, Storage, SRI

6	Hinge (stainless)	TA2314 (size as required)	US26D	MK	087100
2	Flush Bolt	555	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 O	EN	SA	087100
2	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
2	Wall Stop	406	US26D	RO	087100
1	Threshold	1665A		PE	087100
2	Astragal	29310CP TKSP		PE	087100
2	Silencer	608-RKW		RO	087100

Set: 15.0

Doors: 133
Description: Interior Single, Storage

3	Hinge	TA2714 (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Surface Closer	R4400	689	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	406	US26D	RO	087100
3	Silencer	608-RKW		RO	087100

Set: 16.0

Doors: 129
Description: Interior Single, Elevator SRI

3	Hinge (stainless)	TA2314 (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 O	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
3	Silencer	608-RKW		RO	087100

Set: 17.0

Doors: 114, 125, 126

Description: Single Interior, Elect/IT

3	Hinge	TA2714 (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Surface Closer	R4400	689	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 18.0

Doors: 145, 163A, 163C

Description: Interior Single, Storage/Yard, SRI

3	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	MO 4705LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
3	Silencer	608-RKW		RO	087100

Set: 19.0

Doors: 108, 109, 110, 111, 112, 119, 120, 121, 122, 124

Description: Interior Single, Coach/Conference

3	Hinge	TA2714 (size as required)	US26D	MK	087100
1	Entry Lock	MO 4707LN 497 K600	626	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 20.0

Doors: 147, 151

Description: Interior Single, Coach, SRI

3	Hinge (stainless)	TA2314 (size as required)	US26D	MK	087100
1	Entry Lock	MO 4707LN 497 K600	626	YA	087100
1	Wall Stop	406	US26D	RO	087100

3	Silencer	608-RKW		RO	087100

Set: 21.0

Doors: 158
Description: Interior Single, First Aid, SRI

3	Hinge (stainless)	TA2314 (size as required)	US26D	MK	087100
1	Privacy Lock	MO 4702LN 497	626	YA	087100
1	Door Closer	DA SRI 281 O	EN	SA	087100
1	Armor Plate	K1050 34" high x 2" LDW SA BEV	US32D	RO	
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 22.0

Doors: 135A, 135B
Description: Interior Single, Conditioning

3	Hinge (heavy weight)	T4A3786 (size as required)	US26D	MK	087100
1	Deadbolt (classroom)	D261 K600	626	YA	087100
1	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
1	Push Plate	70C-RKW	US32D	RO	087100
1	Surface Closer	R4400	689	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 23.0

Doors: 205
Description: Interior Single, Private Viewing

3	Hinge	TA2714 (size as required)	US26D	MK	087100
1	Classroom Lock	MO 4708LN 497 K600	626	YA	087100
1	Surface Closer	R4400	689	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 24.0

Doors: 137B
Description: Interior Single, Corridor, SRI

3	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
1	Classroom Lock	MO 4708LN 497 K600	626	YA	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
3	Silencer	608-RKW		RO	087100

Set: 25.0

Doors: 113, 123, 134, 206
Description: Interior Single, Restroom

3	Hinge	TA2714 (size as required)	US26D	MK	087100
1	Privacy Lock	MO 4702LN 497	626	YA	087100
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 26.0

Not Used

Set: 27.0

Doors: 159B
Description: Interior Single, Trainer, SRI

3	Hinge (stainless)	TA2314 NRP (size as required)	US26D	MK	087100
1	Entry Lock	MO 4707LN 497 K600	626	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
1	Wall Stop	406	US26D	RO	087100
3	Silencer	608-RKW		RO	087100

Set: 28.0

Doors: 155, 156
Description: Interior Single, Lifeguard Restroom, SRI

3	Hinge (stainless)	TA2314 (size as required)	US26D	MK	087100
1	Privacy Lock	MO 4702LN 497	626	YA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
1	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100

Set: 29.0

Doors: 140
Description: Interior Pair, Classroom

6	Hinge (heavy weight)	T4A3786 NRP (size as required)	US26D	MK	087100
1	Deadbolt (classroom)	D261 K600	626	YA	087100
2	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
2	Push Plate	70C-RKW	US32D	RO	087100
2	Surface Closer	PR4400	689	YA	087100
2	Kick Plate	K1050 10" high x 2" LDW CSK BEV	US32D	RO	087100
2	Wall Stop	406	US26D	RO	087100
1	Gasketing	S88BL		PE	087100
1	Astragal	29310CP TKSP		PE	087100

Set: 30.0

Doors: 154
Description: Interior Pair, Break, SRI

6	Hinge (stainless heavy weight)	T4A3386 NRP (size as required)	US26D	MK	087100
1	Deadbolt (classroom)	D261 K600	626	YA	087100
2	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
2	Push Plate	70C-RKW	US32D	RO	087100
2	Door Closer	SRI 281 O	EN	SA	087100
2	Kick Plate	K1050 10" high x 1" LDW SA BEV	US32D	RO	
2	Wall Stop	406	US26D	RO	087100
2	Astragal	29310CP TKSP		PE	087100
2	Silencer	608-RKW		RO	087100

Set: 31.0

Doors: 146, 150
Description: Interior Single, Women/Men, SRI

3	Hinge (stainless heavy weight)	T4A3386 NRP (size as required)	US26D	MK	087100
1	Deadbolt (classroom)	D261 K600	626	YA	087100
1	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
1	Push Plate	70C-RKW	US32D	RO	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
3	Silencer	608-RKW		RO	087100

Set: 32.0

Doors: 127
Description: Interior Pair, Corridor, SRI HO

6	Hinge (stainless heavy weight)	T4A3386 NRP (size as required)	US26D	MK	087100
1	Deadbolt (classroom)	D261 K600	626	YA	087100
2	Offset Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	087100
2	Push Plate	70C-RKW	US32D	RO	087100
2	Door Closer	SRI 281 CPSH	EN	SA	087100
2	Kick Plate	K1050 10" high x 1" LDW SA BEV	US32D	RO	
2	Astragal	29310CP TKSP		PE	087100
2	Silencer	608-RKW		RO	087100

Set: 33.0

Doors: 148, 152
Description: Interior Single, Women/Men, SRI

3	Hinge (stainless heavy weight)	T4A3386 (size as required)	US26D	MK	087100
1	Door Pull	RM3300-24 Mtg-Type 12XHD	US32D	RO	087100
1	Push Plate	70C-RKW	US32D	RO	087100
1	Door Closer	SRI 281 CPS	EN	SA	087100
1	Kick Plate	K1050 10" high x 2" LDW SA BEV	US32D	RO	
3	Silencer	608-RKW		RO	087100

END OF SECTION

SECTION 08 80 00
GLAZING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Glazed entrances.

B. Related Sections:

1. Section 057300 "Decorative Metal Railings" for glass panels in railings.
2. Section 084126 "All-Glass Entrances and Storefronts."
3. Section 084229.13 "Folding Automatic Entrances."
4. Section 084229.23 "Sliding Automatic Entrances."
5. Section 084229.33 "Swinging Automatic Entrances."
6. Section 084233 "Revolving Door Entrances."
7. Section 084423 "Structural-Sealant-Glazed Curtain Walls" for glazing sealants.
8. Section 088113 "Decorative Glass Glazing."
9. Section 088300 "Mirrors."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 and ICC's International Building Code by a qualified professional engineer, using the following design criteria:
   1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
      a. Wind Design Data: As indicated on Drawings.
      b. Basic Wind Speed: 140 mph.
      c. Exposure Category: C.
   2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
   3. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:
      a. Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.
      b. Inward design wind pressure plus the weight of the glass plus half of the design snow load. Base design on glass type factors for short-duration load.
      c. Half of the inward design wind pressure plus the weight of the glass plus the design snow load. Base design on glass type factors for long-duration load.
   4. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
   5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
   6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than eight (8) Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.

1. Tinted glass.
2. Insulating glass.

C. Glazing Accessory Samples: For gaskets, sealants and, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers manufacturers of insulating-glass units with sputter-coated, low-e coatings and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain tinted float glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

L. Preinstallation Conference: Conduct conference at Project site.

   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: (10) Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Type: Low-E Tinted Insulating Glass. Outdoor: PPG Vista Cool Pacifica color, low-reflective glass outdoor appearance.

1. Product: PPG Vista Cool Pacifica-Solarban 60, PPG Industries, Inc.

2. Insulating Unit Construction: 1/4 inch (6mm) “Solargray™” Glass, “Solarban” 70XL Solar Control (Sputtered) on second surface (2), + 1/2 inch (13mm) air space + 1/4 inch (6mm) Clear Float Glass.

3. Performance Values: Visible Light Transmission – 26 percent; SHGC – 0.21; Shading Coefficient – 0.23; Outdoor Visible Light Reflectance – 11 percent.

4. Heat Transfer Coefficient: U-Value Winter – 0.29, U-Value Summer – 0.24.

5. No substitution allowed

6. PPG Certified Fabricator only

B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior and Interior Lites: Not less than ¼" each (double pane).
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

C. Strength: Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

D. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic protection testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

2.3 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Manufacturers Name: As provided by: RGV Glass (956-381-6661)
2. Substitutions: Section 01600- Product Requirements.

B. Insulating-Glass Units: (Note: Both indoor and outdoor window units are to receive insulated glass) Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Aluminum clear anodized aluminum with anodic finish. Refer drawings for colors.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements: Tremco Incorporated; Spectrem 1.

2. Applications: Architects Approved Equal.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.9 INSULATING-GLASS TYPES

A. Glass Type: Low-e-coated, blue tinted tempered insulated glass- PPG Vista Cool Pacifica, Solarban 60.

1. Overall Unit Thickness: 1 inch at exterior windows.

2. Thickness of Each Glass Lite: Composed of two ¼" panels at exterior windows, one panel for interior windows.
3. Outdoor Lite: Gray Tinted fully tempered float safety glass-clear glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear fully tempered float glass.
6. Low-E Coating: Pyrolytic on second surface.
7. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.
Wash glass are recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09 29 00
GYPSUM WALLBOARD

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, and services necessary for Gypsum Wallboard Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:

1. Gypsum Wallboard Materials and Accessories.

2. Sound-rated Construction.

3. Non-Load Bearing Metal Stud Framing for Interior Work.

4. Load-Bearing Metal Stud Framing for Interior Work.

5. Suspension System for Gypsum Wallboard.

6. Fire-Rated Wall Construction.

7. Gypsum Sheathing Panels and Accessory Materials.

8. Sanding preparation for painting.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Concrete Form Work - Section 03 10 0.

2. Unit Structural Masonry - Section 04 23 00.

3. Cold-Formed Metal Framing- Section 05 40 00.

4. Miscellaneous Metal Work - Section 05 50 00.

5. Rough Carpentry Work - Section 06 10 00.

6. Thermal Insulation - Section 07 21 00.

7. Board Insulation - Section 07 21 2.

8. Plaster Veneer System - Section 07 24 00.

9. Joint Protection - Section 07 90 00.

10. Aluminum Framed Entrances and Storefronts - Section 08 41 13.

11. Tile Work - Section 09 31 00.

12. Acoustical Panel Ceiling - Section 09 51 13.

13. Resilient Bases and Accessories- Section 09 65 13.

14. Paint and Coatings - Section 09 90 00.

1.02 REFERENCE SPECIFICATIONS

A. ASTM International Standard Specifications: As refered to herein, and throughout this section.

1. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.

2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

4. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

5. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

6. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.

7. ASTM C1396 - Standard Specification for Gypsum Board.

8. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.

1.03 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Product Data: Submit Product Data for each type of product specified.

D. Shop Drawings:

1. Load Bearing Framing: Include placing drawings for framing members showing size and gauge designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, accessories, and details required for proper installation. Detail connections to structural steel and structural concrete. Indicate member gauges, spacing, and sizes.

2. Structural Calculations: Submit complete structural calculations for load bearing metal stud framing indicating loads, stresses, and deflections for members and connections. Calculations shall be sealed by a Professional Engineer licensed in the State of the proposed Project, experienced in the design of light gauge framing.

1.05 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products, under the following conditions:

1. Gypsum Board Partitions:

a. Standard Systems: Maximum deflection of L/240 of partition height.

b. Systems to receive Water-Resistant Gypsum Board or Cement Backer Board: Maximum deflection of L/360 of partition height.

2. Interior Suspended Ceilings and Soffits: Maximum deflection of L/360 of distance between supports.

B. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90 - Standard Test ethod

for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.06 DELIVERY AND STORAGE

A. General:

1. Deliver all materials to the site in protective wrappings, clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.

2. When material delivery schedules necessitate delivery of the materials before the building is enclosed, or prior to installation of the materials, provide weathertight protection in the form of frame construction, with solid wall sheathing and a pitched roof, for the temporary storage of the materials. A waterproof covering of wallboard in lieu of the temporary building is not acceptable.

B. Gypsum Wallboard: When delivered, the wallboard with unbroken bundling tape shall be neatly piled flat on the floor without overlapping the floor. Storage area shall be protected from the weather.

C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.07 PROJECT CONDITIONS

A. Exterior gypsum soffit panel application and joint finishing, exterior Work temperature shall be a minimum of 55°F.

B. Interior gypsum panel application and joint finishing within the building, maintain temperatures within the range of 55°F. to 70°F.

C. Provide ventilation to remove excess moisture.

D. Rooms or areas in which Work is to be installed shall be at temperatures as specified herein, twenty-four (24) hours prior to installation to at least five (5) days after completion of installation. Refer to Division 00 “Supplementary Conditions” for description of temporary heat.

1.08 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding and ladders in accordance with local, state, and national safety codes. Equipment shall be erected at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from site.

1.09 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

1.10 MATERIAL DELIVERY, STORAGE & HANDLING

A. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART 2 - PRODUCTS

2.01 A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 GYPSUM WALLBOARD MATERIALS AND ACCESSORIES

A. Gypsum Wallboard: ASTM Standard 48" wide sheets with tapered or rounded (eased) edges, in lengths as long as practical to minimize jointing, of thickness shown on Drawings, as manufactured by United States Gypsum Company, a subsidiary of USG Corporation; National Gypsum Company; or G-P Gypsum Corporation. Provide the following types:

1. Standard Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM Standard C36).

2. Type X Fire-Rated Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM Standard C36).

3. Water-Resistant Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM C630).

4. Foil-Back Standard Gypsum Wallboard: ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. Joint Tape, Joint Cement, and Adhesives:

1. Joint Tape: Perforated paper tape made especially for drywall joint reinforcing, conforming with ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

2. Joint Cement: Two compound system (joint compound and topping compound) conforming with ASTM Standard C475.

   a. Provide special joint cement recommended by manufacturer for water-resistant gypsum board.

3. Adhesives: Provide adhesives conforming to ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Frame, as recommended by the wallboard manufacturer.

   a. Volatile Organic Compounds (VOC) Content: paint and coatings product specified herein shall have a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

C. Metal Stud Framing Systems:

1. Non Load-Bearing: Framing system consisting of metal studs of sizes required for wallthicknesses, or of sizes noted on the Drawings, with mating floor and ceiling track, and all erection accessories. Studs and tracks shall be of cold rolled steel channels conforming to ASTM Standard C645, with an electro-galvanized finish, of not less than the following thicknesses.

   a. 25 gauge thick for partitions up to 16'-0" high at 16" O.C.

   b. 20 gauge thick for partitions over 16'-0" high (but less than 18'-0" high), at 16" O.C.

   c. Where partitions of greater height are required by the Drawings, a heavier gauge shall be required and shall be subject to the Architect's review.

2. Load-Bearing: Galvanized steel framing system conforming to ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; shall be 20 gauge (min.) “SJ” style stud members (“C” type studs with stiffening ribs) of sizes and lengths noted on Drawings, with mating running track, and all required erection accessories such as lintels, strappings, clip angles, joists, as manufactured by United States Gypsum Company.

3. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

D. Steel Channels: 1-1/2" cold rolled steel channels weighing not less than 475 pounds per 1000 linear feet; 2-1/2" cold rolled steel channels weighing not less than 800 pounds per 1000 linear feet. All channels shall be galvanized.

1. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

E. Furring Channels: Provide furring widths (depths) as noted on the Drawings.

1. Hat-Shaped Channels: Cold rolled, electro-galvanized sheet steel, United States Gypsum Company, #DWC-25, 7/8" deep, 25 gauge minimum, conforming to ASTM Standard C645.

2. Z-Furring Channels: Interior Framing Product, Z-Furring (ZF-Series) as manufactured by Dietrich Metal Framing, 200 Old Wilson Bridge Road, Columbus, OH 43085, (800)873-2604. Furring channels shall be 25 gauge (minimum) corrosion resistant galvanized steel, conforming to ASTM Standards A653 and A754.

3. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

F. Felt Protection Strips: Provide Type I, No. 15, unperforated felt conforming to ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, in width as required to fully cover contact surface area between metal studs and/or furring channels and exterior wall.

G. Hangers: Not less than 8 ga. annealed zinc coated steel wire or 1" x 1/8" unperforated galvanized steel bands.

H. Tie Wire: Stainless steel or annealed zinc coated steel wire, 16 gauge minimum.

I. Screws: Phillips head screw fasteners conforming to ASTM Standard C954, with self-drilling point, self-tapping thread, and rust resistant coating, not less than #6 x 1" long, except as otherwise required for fire resistive ratings.

J. Nails: GWB-54, bright finish, annular ringed nails conforming with ASTM Standard C514 (formerly ASTM Standard C380), of length to provide 3/4" minimum penetration into framing or furring, except as otherwise required for fire resistive ratings.

K. Corner Beads: Formed to an angle of 90 degrees, zinc-coated steel not lighter than 26 gauge (0.0179 inch in normal thickness) with wings not less than 7/8 inch wide and perforated for screws/nails and cement treatment, or formed of zinc-coated steel or protected aluminum with legs approximately 3/4" wide and cemented under pressure with a rubber base adhesive to tough paper jointing tape wings not less than 1" wide. Zinc-coated steel shall conform to Federal Specification QQ-S-775 Type I, Class C.

L. Casing Beads: United States Gypsum Company, USG - No. 200-A galvanized metal trim, or equivalent 26 gauge galvanized casing bead by National Gypsum Company.

M. Control Joints: United States Gypsum Company, USG - Zinc Control Joint No. 093, or equivalent 26 gauge galvanized metal control joint product by National Gypsum Company.

N. Special Trim: Provide where/if indicated, special trim fabricated from No. 26 gauge galvanized sheet steel to the shape shown on Drawings.

O. Angle-Type Hangers: Unless otherwise indicated on the Drawings provide angles with legs not less than 7/8 inch wide, formed from 0.0635 inch thick galvanized steel sheet complying with ASTM Standard A653 (formerly ASTM Standard A446), Coating Designation G90, with bolted connections and 5/16 inch diameter bolts.

2.03 GYPSUM SHEATHING PANELS AND MATERIALS

A. Manufacturers: Panels specified herein shall be as manufactured by Georgia-Pacific Gypsum LLC, 133 Peachtree Street, Atlanta, GA, 30303, (800)947-4497 or (800)225-6119.

1. Comparable Products: Gypsum sheathing panels by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect’s review.

B. Gypsum Sheathing Panels:

1. At Plaster Veneer System: ASTM Standard C1396 (formerly ASTM Standard C79).

2. At Plaster Veneer System: When extensive winter weather exposure is anticipated, provide square edge, noncombustible, gypsum sheathing panels, in accordance with ASTM Standards E136, C1177 and C1396 (formerly ASTM Standard C79), 1/2" (nominal thickness) Dens- Glass™ Exterior Sheathing (formerly Dens-Glass® Gold Exterior Sheathing with R-Value of 0.56 when tested in accordance with ASTM Standard C518. Gypsum panels shall be made of a treated, water-resistant core, surfaced with fiberglass mats and a “Gold” colored primer coating.

C. Accessory Materials:

1. Fasteners: Steel drill screws, in lengths recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating.

a. For steel framing less than 0.0329 inch thick, attach sheathing with steel drill screws complying with ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

b. For steel framing from 0.033 to 0.112 inch thick, attach sheathing with steel drill screws complying with ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 COLD-FORMED (LOAD-BEARING) METAL FRAMING

A. Exterior Metal Framing: Metal framing shown on Drawings for gypsum wallboard sheathing shall be furnished and installed by the Cold-Formed Metal Framing Contractor.

B. Wood Framing and Furring: Wood framing and furring where shown on Drawings for gypsum wallboard finish shall be furnished and installed by the Rough Carpentry Contractor.

C. Load Bearing Metal Stud Framing: Provide load bearing metal stud and joist framing at the following locations:

1. Toilet Room walls and ceilings.

2. As indicated on the Drawings.

3.03 METAL STUD FRAMING (NON LOAD-BEARING TYPE STUDS)

A. Furnish and install non-load bearing metal stud framing for gypsum wallboard partitions, support of gypsum wallboard in locations noted, or where other types of framing are not

provided. Framing shall consist of vertical studs framed into continuous top and bottom tracks. Studs shall be of sizes noted on the Drawings or as required to produce the partitions of thicknesses noted, and tracks shall be of mating sizes. In general, framing shall be of single stud depth. Where wall thickness is greater than stud depths, and where plumbing spaces are indicated, frame each wall surface with a separate stud frame.

1. Where partitions are to have gypsum wallboard on both sides, use 25 gauge metal studs for partitions up to 16'-0" high; use 20 gauge metal studs for partitions from 16'-0" to 18'-0" in height.

2. Where partitions are to have gypsum wallboard on one side only, use 25 gauge metal studs for partitions up to 14'-6" high; use 20 gauge metal studs for partitions from 14'-6" to 17'-3" in height. At these partitions (wallboard at one side), provide continuous cold rolled stiffener channels at third points, secured with screws or by welding. Securing by wiring shall not be accepted.

3. The above gauge requirements are based on 3-5/8 inch deep studs at 16" centers. Metal gauges for studs of different depth or spacings shall be subject to review by the Architect.

B. Extend partition framing from floor to underside of finish ceilings, to 6" minimum above finish ceilings, or to underside of metal roof deck construction above, as indicated on the Drawings.

C. Bottom and Top Track Installation:

1. Secure bottom tracks to supporting construction, both ends, corners, jambs of openings, and 24" centers with bolts and metallic expansion sleeves.

2. Where partition framing extends to underside of metal roof deck, secure top track to roof steel framing where perpendicular thereto. Where partitions are parallel to roof steel, brace top track to adjacent building framing with pieces of studs, at 48" O.C., maximum. Insulation Contractor shall furnish safing insulation for top track and where indicated on Drawings.

   a. Isolate stud system from transfer of structural loading to system, horizontally and vertically. Provide slip type joints to attain lateral support, allowances for deflection, and avoid axial loading.

3. Where partition framing are ceiling high and ceilings are finished with gypsum wallboard, secure top track through wallboard to ceiling framing, at each intersection.

4. Where partition are ceiling high and ceilings are acoustical ceilings, after acoustic panels above partition are installed, install top track at underside of ceiling grid by

bolting the tracks to the grid, separating top track from ceiling with a strip of polyethylene film.

5. In all areas of ceiling high partition, and in areas where framing extends only 4" above finish ceilings, conceal brace the top of the partition to steel framing at 48" O.C., maximum, in the area above the ceilings.

D. Furnish single length, unspliced studs for all locations. Furnish studs cut short to provide a 1/2" space between top of stud and underside of top track. Secure studs at corners, intersections, ends and both sides of openings to bottom track, at both stud flanges, with screws. In all other locations studs shall twist into tracks so as to be held by friction and to permit differential deflection between top and bottom track support construction. NOTE: In fire-rated walls frame fastening shall be in accordance with code requirements governing fire-rated construction.

E. Framing:

1. Frame partition corners by butting one wall against the other, with one stud at the end of the abutting wall and with two studs at the end of the other wall, forming a three stud corner.

2. Frame partition intersections by butting the intersecting wall against the wallboard-finished through-wall, providing two studs at intersection in through-wall, one stud at end of abutting wall, and bolting stud at end of abutting wall to wallboard of through-wall, at 24" O.C.

3. Frame openings with floor track at head and sills, welded to stud at jambs, with jack studs above and below openings to continue stud spacing pattern, omitting sill and bottom studs at door openings. Brace studs at jambs of openings back to first adjacent stud with furring channels at head and at 24" O.C. to floor line, welded in place at both ends.

4. Control joints shall be framed by placing two studs back to back, with a 1/2" open space between backs, and by interrupting tracks with a 1/2" open space, at the joint.

F. Completed framing shall provide straight true, plumb planes to receive the gypsum wallboard. Openings shall be true rectangles.

3.04 CEILING AND SOFFIT FRAMING

A. Furnish and install a concealed framing system for all gypsum wallboard ceilings (except toilet room ceiling), consisting of 1-1/2" runner channels, spaced not over 4'-0" on centers, erected parallel to partitions and walls. Hang suspended ceiling framing from the steel framing above.

B. Hang runner channels from above the hangers spaced at 48" O.C., maximum, along each channel. Erect hangers approximately plumb. Wrap each wire hanger around the runner channel, the steel joist, and around itself three times. If steel band hangers are used, secure each steel band to the runner channel by wrapping tightly around the channel and bolting to itself. All connections shall develop the full strength of the hangers.

1. Do not attach hangers to roof deck, ductwork, duct supports, piping, conduit or hangers for same.

2. Where ductwork or other construction interferes with typical hanger spacing, provide trapezes, or other approved framing, to frame around such items and to support the hangers.

3. Pairs of diagonal hangers, extending from runner at midpoint between joists to top chord of joists at each side may be provided to reduce hanger spacing to 48" centers or less along the runner.

4. Provide additional hangers at light fixtures, diffusers, grilles, and other points of extra loading.

C. Erect runners level, parallel to room walls and parallel to each other. Provide a runner adjacent to, and within 3" of, walls where parallel to same. Provide runners at top and bottom edges of all ceiling drops. Cut off ends of runners 1/2" from walls where perpendicular thereto. Splice, when required, at hangers only, by lapping 12" and securely tying.

D. Where control joint or expansion joint is required by Drawings or Specifications, and runners are parallel to the joint, provide runner channel at each side of joint and secure each, independently of each other, to the framing above. Where runners are perpendicular to the joint, terminate runners at each side of joint, allowing a 1/2" wide, minimum, break in the runners, aligned with joint.

E. Frame and brace all openings in ceilings that have any side dimension over 2 ft. as a part of the suspension system. Provide all required metal framing, bracing, supports, blocking and wedging necessary to install the framing rigidly and securely in position. Do all cutting and drilling required to install and fasten framing and furring in place. Erect runners to true lines, levels and planes so as to provide a true, flat, system or surface to receive the succeeding Work.

3.05 METAL FURRING

A. Furnish and install metal furring to support gypsum wallboard ceilings, ceiling drops, and soffits at the lines and elevations as shown and/or noted on the Drawings.

B. Erect furring in straight continuous rows and in parallel alignment, spaced l6" O.C. Splice furring, where required, by nesting or lapping adjacent members not less than 8" and by double tying the lap splice.

1. At ceilings, ceiling drops, and soffits, erect furring at right angles to supporting framing.

2. Where furring is parallel to edges of wallboard finish, provide a furring member at wallboard edge.

3. Where furring is at right angles to edges of wallboard finish, extend furring to such edges, mitering or coping members at corners.

C. Where control joint or expansion joint is required provide a furring member at each side of joint, along edge of wallboard.

D. Provide steel framing, bracing, shimming and supplementary framing as required to erect furring at the required lines and elevations. Secure furring to ceiling framing runners and to building framing by saddle tying with two (2) strands of tie wire.

E. Direct Metal Stud and/or Furring Channel Attachment to Walls: Where dampproofing is not indicated and/or specified and metal stud and/or furring channel is installed directly to exterior wall, install felt protection strip between metal stud and/or furring channel and wall. Attach metal furring channels, spaced 24" O.C. maximum unless otherwise as noted on the Drawings, to interior of masonry and/or concrete surfaces with hammer-set or power-driven fasteners staggered 24" O.C. maximum on opposite flanges.

3.06 GYPSUM WALLBOARD INSTALLATION

A. Furnish and install gypsum wallboard on the exposed side or sides of stud partition framing and coldformed metal framing, on one side of all furred areas, fire stops, and where shown on Drawings.

1. Unless otherwise indicated on the Drawings, provide multiple-layer wallboard as indicated or required for fire-rated partition construction. Provide single layer wallboard for all other locations.

a. Refer to the Drawings for partition framing construction requiring wallboard to metal roof deck.

b. Provide fire-rated gypsum wallboard where indicated on Drawings.

c. Provide exterior gypsum wallboard sheathing at exterior wall areas for plaster veneer system as indicated on Drawings.

d. Provide water-resistant gypsum wallboard at interior face side of Toilet Room walls, and other locations as indicated on the Drawings.

e. Provide foil-faced gypsum wallboard where indicated on Drawings.

f. Provide standard gypsum wallboard at all other areas.

2. Cover full height of stud partition framing with wallboard, including the portion above ceilings.

3. In all wall and partition Work, except where partition framings terminate at underside of ceilings, extend wall and partition wallboard up past edge of ceiling wallboard, and cope edge of ceiling wallboard to such vertical surfaces forming a control joint.

4. At all control joints, provide a 1/4" wide, straight open joint in the wallboard, at the joint centerline.

5. In addition to the required fastening of wallboard panels vertically, secure gypsum wallboard at partitions with screws 16" O.C. to bottom and top track; at FIRE-RATED PARTITION(S), spacing of screws at bottom and top track shall be 8" O.C.

B. Installations:

1. Single Layer Installations:

a. If wallboard is obtainable in length to span full height in a single piece, install wallboard with long dimension vertical; otherwise install wallboard with long dimension horizontal; with vertical joints aligned over studs or furring in both cases.

b. At soffit/ceiling and soffit/ceiling drop Work, install wallboard with long dimension at right angles to support framing, with end joints aligned over framing members.

c. Apply all wallboard with the reverse side against the framing members, and with the separate boards in moderate contact, but not forced into place. At internal and external corners, conceal the cut edge of the boards with the overlapping covered edge of the abutting board. Stagger the boards so that the corners of any four boards will not meet at a common point except in vertical corners.

2. Double Layer Installations:

   a. Install and secure the base layer of wallboard in accordance with requirements specified above for single layer installation, except wallboard on walls and partitions may be installed with long dimension horizontal in all cases.

   b. Apply face layer of wallboard over base layer in same manner and positioning as specified for base layer, off-setting joints not less than 10" from joints of base layer. Secure face layer to base layer with full, uniform coatings of adhesive, applied to both contact surfaces with a brush, roller or serrated spreader. Impact layers together to insure thorough and maximum bonding. Form corners by overlapping board ends of base layer. Provide screw or nail fastening to supplement adhesive fastenings as may be required.
   NOTE: At fire-rated installations, supplemental fastening is required, with screws 24" O.C. along center line and edges of each sheet - joints finished.

C. Screw Fastening:

1. Power drive all screws with an electric screwdriver until the screw head provides a slight depression below the surface of the wallboard, but no further. Do not break the paper covering in the board. If the paper surface is broken, place another screw approximately 2 inches from the damaged surface.

2. Screws shall be spaced a maximum of 8" O.C., and not closer than 3/8" to edges. Pair, not stagger, fasteners at edge joints between adjacent sheets.

3. Fastening for vertical and horizontal application shall begin at the top center of the panel and proceed outward to the edges or ends, with the top completed before proceeding. Fastening the field of the panel shall begin with the member nearest the center of the panel and proceed outward to the edges or ends, with the fastening completed on each member before proceeding to the next member.

D. Nail Fastening:

1. Where wallboard is required to be secured to wood furring member, installation shall be with annular nails. Nailing for vertical and horizontal application shall be as specified for screw fastening above, except with maximum (nail) spacings of 7" O.C. at ceilings, and 8" O.C. at walls.

2. Wallboard may also be secured to wood framing members and furring with screws, in which case, the application shall be as specified for screw fastening above, including maximum screw spacings.

3.07 EXPANSION JOINTS AND CONTROL JOINTS

A. Expansion Joints: Provide expansion joints where noted on the Drawings and/or required by field conditions. Provide two (2) metal casing beads, back to back, with open space of size detailed on Drawings between backs, at expansion joint centerlines.

B. Control Joints: Where not indicated on Drawings, gypsum panel surfaces shall be isolated with control joints where partition or furring run exceeds 30 ft.; where soffit/ceiling dimensions exceed 50 ft. in either direction, or area within separate soffit/ceiling sections exceeds 2,500 sq. ft.; where wings of “L”, “U”, and “T” shaped soffit/ceiling areas are joined; where soffits/ceilings abut partition or vertical surface; and where expansion or control joints occur in base exterior wall. Back joint by double studs or furring channels.

1. Where soffits/ceilings abut partitions or vertical surfaces, install dust stop gasket (with slight fullness to allow for movement of joint), then install soffit/ceiling wallboard with metal casing bead at exposed edge, forming a 1/8" to 1/4" wide open space between the abutting surfaces. Casing beads shall be flushed with wallboard in same manner as hereinafter specified for edge treatment.

2. Install at all other control joint locations, approved, roll-formed zinc control joints, attaching with Bostich® 9/16" “G” staples, or approved equal, spaced not over 6" apart. Cut end joints square and align for neat fit. Control joint shall then be given joint finishing treatment as hereinafter specified. Remove protective tape when joint treatment is completed.

3.08 SOUND-RATED CONSTRUCTION:

A. Insulation: Coordinate with Acoustic Insulation Contractor for installation of acoustic insulation in sound-rated partitions where indicated on the Drawings.

B. Gypsum Board:

1. Install gypsum board same as for interior partitions and ceilings.

2. Coordinate with installation of perimeter sealants.

3. After installation of gypsum board base layer(s), cut face layer sheets 1/2 inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction.

C. Sound Flanking Paths: Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.

3.09 CORNER AND EDGE TREATMENT

A. Internal Corners: Treat all exposed internal corners, as specified herein under Article for FINISHING. Reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.

B. External Corners: At external corners neatly fit a corner bead over the corner and secure with the same type screws used for applying wallboard. Space screws approximately 6 inches on centers, driving through the wallboard into the framing member. After the corner piece has been secured in place, treat the corner with joint cement and reinforcing tape in the manner as specified herein under Article for FINISHING. Feather final coat of topping compound out from 12 to 16 inches on both sides of corner.

C. Edges: Finish all exposed edges of wallboard, including perimeter of all soffit/ceiling areas, and edges abutting masonry, concrete, door frames, window frames, and other finish construction, with metal casing beads. Casing beads shall be flushed with wallboard surface in manner herein before specified for external corners, topping compound feathered out from 12 to 16 inches to surfaces of wallboard.
All Work shall be sanded smooth when dry.

3.10 FINISHING

A. Levels of Finish: Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA-214, “Recommended Levels of Gypsum Board Finish”.

1. Level 1: All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

    a. Locations: Provide Level 1 finish for gypsum board surfaces in ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.

2. Level 2: All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied
over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.

    a. Locations: Provide Level 2 finish for gypsum board substrate at tile and FRP panels, except remove tool marks and ridges.

3. Level 3: All joints and interior angles shall have tape embedded in joint compound and one (1) additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two (2) separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: The prepared surface shall be coated with a drywall primer by the Painting Contractor prior to the application of final finishes as specified in Division 09.

    a. Locations: Provide Level 3 finish for gypsum board surfaces, where heavy- or medium textured finishes or heavy-grade vinyl wallcovering will be used.

4. Level 4: All joints and interior angles shall have tape embedded in joint compound and two (2) separate coats of joint compound applied over all flat joints and one (1) separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: The prepared surface shall be coated with a drywall primer by the Painting Contractor prior to the application of final finishes as specified in Division 09.

    a. Locations: Provide Level 4 finish for gypsum board surfaces, where smooth flat paints, light textures, or light- or medium-grade wallcoverings are to be applied.

B. Interior Gypsum Board:

1. Prefill:

    a. Use setting-type joint compound. Mix joint compound according to manufacturer’s directions.

    b. Fill joints between boards flush to top of eased or beveled edge.

    c. Wipe off excess compound and allow compound to harden.

2. Taping (Level 1):

    a. Use taping or all purpose compound.

    b. Butter taping compound into inside corners and joints.

    c. Center tape over joints and press down into fresh compound.

    d. Remove excess compound.

e. Tape joints of gypsum board above suspended ceilings.

3. First Coat (Level 2):

a. Use taping or all-purpose drying-type compound, or setting-type joint compound.

b. Immediately after bedding tape, apply a thin skim coat of joint compound trowel applied over body of tape and allow to dry completely in accordance with manufacturer's instructions.

c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.

4. Second Coat (Level 3): Use all purpose or topping drying type joint compound. After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.

5. Third Coat (Level 4):

a. Use all purpose or topping drying type joint compound.

b. After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.

c. Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and make suitable and ready for
application of final finish by others.

C. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.

1. For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.

a. Do not crown joints or leave excess compound on panels.

b. Remove tool marks and ridges.

c. For fastener heads to be covered with tile, apply one (1) coat of joint compound.

D. Joint Compound:

1. After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.

2. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

E. Trim:

1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.

2. Install metal corner beads at external corners.

3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.

F. Control Joints: Install where indicated and specified.

G. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

3.11 GYPSUM SHEATHING PANELS

A. Preparation: Examine exterior metal stud framing and verify that the surface of the framing members to receive the sheathing does not vary more than 1/4" from the plane of faces of adjacent members.

1. Inspection: Steel framing stud spacing shall not exceed 16 inches O.C. for 1/2 inch thick gypsum sheathing panels and 24 inches O.C. for 5/8 inch thick gypsum sheathing panels.

2. Notification: Contact the General Contractor, in writing, for correction, of any condition, detrimental to the installation of this Work.

B. Sheathing Installation: Provide sheathing where indicated on the Drawings and as specified herein. Install sheathing in accordance with ASTM Standard C1280 and the manufacturer's written installation instructions and recommendations.

1. Fiberglass-faced gypsum sheathing, where indicated on the Drawings, over metal stud framing shall be installed with the "gold side" out (exposed to exterior view/side).

a. Fasteners shall be flush to the face of the board, not countersunk.

b. Do not laminate sheathing to masonry surfaces.

3.12 SURFACE PREPARATION FOR PAINTING

A. Where painting of gypsum wallboard surface or vinyl wallcovering is indicated on the Drawings, tape, spackle and sand flush all surface imperfections, cracks, and gouges to make suitable for finish painting by the Painting Contractor.

3.13 CLEAN-UP

A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish to central area designated for clean-up by the General Contractor. Remove all unused materials, tools, and equipment from site.

B. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 31 00
THIN-SET TILE WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Thin-Set Tile Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Porcelain, Ceramic Floor and Wall Tiles.

2. Special Tile Shapes.

3. Setting Materials, Accessories, and Sealants.

B. Color Selections: Refer to Color Legend on the Drawings.

C. Room Finish Schedule and Colors: Refer to the Drawings.

D. Related Sections: The following Work will be provided under other sections of the Specifications:

1. Unit Structural Masonry - Section 04 23 00.

3. Rough Carpentry - Section 06 10 00.

4. Joint Protection - Section 07 90 00.

5. Aluminum Framed Entrances and Storefronts - Section 08 41 13.

6. Cementitious Backing Boards - Section 09 28 13.

7. Gypsum Wallboard - Section 09 29 00.

8. Resilient Bases and Accessories - Section 09 65 13.

9. Paints and Coatings - Section 09 90 01.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Requirements of Regulatory Agencies: Furnish and install all Tile Work in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

B. References: Unless otherwise specified herein, all tile materials, installation, and workmanship shall conform to the following:

1. American National Standards Institute (ANSI):

a. A108.5 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex- Portland Cement Mortar.

b. A118.1 Specifications for Dry-Set Portland Cement Mortar.

c. A118.3 Specifications for Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.

2. Tile Council of North America, Inc. (TCNA): American National Standards Specifications for Ceramic Tile - ANSI 137.1, current edition.

C. Codes and Ordinances: Where requirements of governing Federal, Local and/or State Codes and Ordinances are more stringent than the requirements specified herein, the requirements of such Codes and Ordinances shall govern, as applicable.

1.03 QUALITY ASSURANCE

A. General: Contractor for Tile Work shall be responsible for an acceptable completed installation for areas designated to be tiled. Work shall be in complete conformity to the type of tile, dimensions, colors, grades, patterns, and necessary trim units as shown on Drawings and/or required by field conditions.

B. Installer: Firm shall have specialized in Tile and Countertop Work for a period of not less than five (5) years of proven successful experience satisfactory to the Architect and/or Owner. Work shall be performed by qualified workmen in a manner conforming to best current practice of the trade.

C. Performance Requirements: Tiles and countertops shall be new materials conforming to performance requirements as specified herein. Materials of “second” quality not meeting or exceeding the requirements of these Specifications shall not be accepted.

D. Material Shelf Life: Do not retain setting and sealant materials at the jobsite which have exceeded the shelf life recommended by the manufacturer.

E. Tile Mock-Ups: Prior to installation Work, lay-out in the building, full-size mock-ups of each tile pattern to be used in the Work.

1. Sample areas shall be prepared in the building where and as directed by the Architect and/or Owner's Supervising Engineer.

2. Size of Sample area shall be as designated by the Architect.

3. Remove tile mock-up as directed by Architect.

F. Visual Approvals: Obtain Architect and/or Owner's Supervising Engineer acceptance of visual qualities of the Work during progress of the Work before proceeding with the Work.

1.04 SUBMITTALS

A. General: Submit Samples, Product Data, and Certificates to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

1. Mark each tile and/or marble Sample legibly, with the Identity of the Sample, the Name of the Installer, the Name of the Project, and the Location in the Building.

B. Tile Samples: Submit two (2) full size Samples of each type (including special shapes) and colors of tile, and provide letters of intent to the Architect, for review and approval prior to starting the Work.

C. Marble Threshold Samples: Submit two (2) Samples not less than 3" x 5", of marble in thickness required.

D. Granite Countertop Samples: Submit two (2) Samples not less than 6" x 6", of granite in thickness required.

E. Sealant Samples: Submit Samples of sealant for review and approval by the Architect. Do not commence Work until the Architect's written approval of the Samples has been received.

1. Submit two (2) Samples of each color required for each sealant exposed to view. Install Sample between two (2) Samples of tile and/or marble material representative of typical joint widths.
Manufacturer's color charts and/or color swatches will not be acceptable as Samples.

F. Grouting Mortar Samples: Submit two (2) Samples of each color required for review and approval by the Architect. Do not commence Work until written approval from the Architect has been received.

G. Metal Edge Trim Strip Samples: Submit two (2) 12" long Samples of metal edge trim angle strip for Architect's review and approval.

H. Product Data: For information only, submit two (2) copies of manufacturer's technical information and installation instructions for all materials required, except bulk materials.

I. Certificates: Before proceeding with the Tile Work, furnish the Architect with a Master Grade Certificate, in the form shown in the TCNA Al37.l signed by the manufacturer and the Contractor certifying the grade, type, and quantity of each kind of tile, together with adequate information for identification of the containers to which they apply.

1.05 PRODUCT DELIVERY

A. Delivery: Deliver all products in original, unopened containers, branded or labeled with the proper grade seal. Mark all containers with designations corresponding with information given on the grade certificates. The containers shall be subject to inspection by the Architect before being opened, as well as during the progress of the Work.

B. Storage: Store and protect materials within waterproof enclosures to prevent water absorption. Handle materials to prevent damage.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 PROJECT CONDITIONS

A. Schedule installation of tile with the Owner's Representative to assure completion of all Tile Work, including all protective measures, prior to receipt and installation of Tenant and/or Owner supplied fixtures, equipment, furnishings, etc.

B. When installing tiles and marble over new concrete slabs, do not start installation until concrete has cured for at least five (5) days and then aged for fourteen (14) additional days, or for such additional time as required for the concrete to have shrunk and attained equilibrium.

C. Install tiles when ambient air temperatures, and temperatures of all materials, is 55°F. or higher. Rooms or areas in which Work is to be installed shall be at temperatures of 55°F. or higher twenty-four (24) hours prior to installation to at least five (5) days after completion of installation. Refer to Division 0 "Supplementary Conditions" for description of temporary heat.

1.07 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

B. Systems Guarantee: Obtain from the setting materials manufacturer, a written Systems Guarantee, guaranteeing that the products specified herein shall be free from manufacturing defects and will not break down or deteriorate for a period of not less than five (5) years from the date of the installation, when installed in accordance with the manufacturer's written specifications and guidelines.

1.08 EXTRA MATERIAL

A. General: Not less than 30 days prior to opening of the facility, deliver to the Owner's Representative, the following materials for future use. Materials shall be delivered with a list of manufacturer's names, product designations, addresses, and phone numbers. Materials shall be boxed, sealed, and clearly identified as to product and specific location of use. Furnish the following quantities of material for use within the designated area.

1. 1% of the total of each color, size, and shape of the tile used, including bases.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Daltile Corporation, which is located at: 7834 C.F. Hawn Fwy. P. O. Box 170130; Dallas, TX 75217; Toll Free Tel: 800-933-TILE; Tel: 214-398-1411; Fax: 214-309-4584; Email: request info (craig.horsley@daltile.com); Web: www.daltile.com

B. Tile Products: Provide tile products of manufacturers, product lines, colors and sizes as noted on the Drawings.

C. Tile Installation Products:

1. Mapei setting and grouting materials as specified herein shall establish the commercial standard of quality and performance required. Mapei® tile installation products as manufactured by Mapei Corporation, 1144 East Newport Center Drive, Deerfield Beach, FL 33442, (954)246-8888 or (800)426-2734; www.mapei.com, will be acceptable, and subject to review by the Architect.

2.02 SPECIAL SHAPES

A. General: Provide special shapes, such as wall base materials, trim pieces, interior cove, corner bullnose, and exterior/interior corner units, to be used in their respective places as required by the Drawings and/or field conditions.

2.03 SETTING MATERIALS

A. Mortar: Improved Modified Dry-Set Cement Mortar for Large and Heavy Tile and standard tile for walls and floors meeting or exceeding ANSI A118.15-A118.11 and ISO 13007; C2ES1P2

1. Product: Subject to compliance with requirements, provide MAPEI Corporation "Ultraflex 3".

B. High Performance Cement Grout: For grout joints from 1/16 inch to 3/4 inch in submerged applications and wall tile applications (1.5 mm to 19 mm) and meeting ANSI A118.7 and ISO 13007; CGWAF.

1. Product: Subject to compliance with requirements, provide MAPEI Corporation "Ultracolor Plus FA".

B. Premium Epoxy Mortar and Grout: Two-component, non-sag, high strength epoxy grout for pool deck and all non-submerged floor applications meeting and exceeding ANSI A118.3 and ISO 13007; R2Tand RG.

1. Product: Subject to compliance with requirements, provide MAPEI Corporation " Kerapoxy CQ"

2. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

G. Fluid-Applied Waterproofing Membrane for non-submerged applications: Liquid-latex rubber or elastomeric polymer product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

1. Product: Subject to compliance with requirements, provide MAPEI Corporation “Mapelastic Waterstop”.

2.04 METAL EDGE TRIM STRIPS

A. Manufacturer: Schluter Systems L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841, (800)472-4588; www.schluter.com, or comparable equivalent manufacturer's product subject to review by the Architect.

B. Product: Edge-protection trim as indicated on the Drawings and/or required by field conditions.

2.05 SEALANTS

A. A. Flexible Sealant: Professional grade 100% silicone sealant specifically formulated for heavy traffic expansion and movement joints for horizontal and vertical complying with ASTM standards; slump (ASTM C639), tack-free time (ASTM C679,) shore "A" hardness (ASTM C661), joint movement (ASTM C920), elongation at break (ASTM D412), flexibility (ASTM C734) and passes weatherabilty (Accelerated Weathering Tester QUV).

1. Product: Subject to compliance with requirements, provide MAPEI Corporation "Mapesil T".

2. Colors: Sealant color shall match grout joint colors and shall be subject to review and approval by the Architect and/or Owner.

PART 3 - EXECUTION

3.01 INSPECTION

A. Surface Inspections: Carefully inspect all surfaces upon which materials will be applied, and report to the General Contractor in writing, any condition detrimental to the installation, for correction prior to proceeding with the Work. The installation of Tile Work will be considered an acceptance of the surfaces to be covered, and claims for failure of Tile and Countertop Work because of unsatisfactory sub-surfaces will not be allowed.

B. Concrete Floor Slab Tolerance Flatness/Levelness: Floor shall comply with ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and FL Floor Levelness Numbers; using the F-Number System.

1. If concrete floor slab surfaces exceed the maximum variation, Tile Contractor shall notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.

3.02 PREPARATION

A. Prepare all surfaces upon which materials will be applied as required to receive Work. Remove all dirt, grease, oil, paint, and other surface contaminations that will prevent proper bonding from the substrate surfaces. Remove all ridges, fins, projections, high spots and other irregularities that would interfere with proper installation Work.

3.03 LAYOUT, CUTTING, AND FITTING

A. Layout all Tile Work to minimize cuts of less than one-half tile in size.

B. Locate cuts to be inconspicuous.

C. Align all floor joints to have straight, uniform grout lines parallel with adjacent walls and surfaces.

D. Whenever possible, align grout joints of wall tile and base tile with floor tile joints.

E. Neatly cut and accurately fit all Tile Work around piping and other installations which pierce the Tile Work; at irregular shaped places; and at the junction with other materials. The surface of the tile shall not be chipped or otherwise be damaged in cutting. Grind cut edges smooth and even.

3.04 WORKMANSHIP AND APPLICATION

A. General: Install tile as indicated on the Drawings and specified herein.

1. Select tile from the same shade and lot number.

2. Visually inspect the tile prior to installation.

3. Mix tiles from several boxes.

4. Rotate the tiles to ensure a non-repeat look.

B. Installations: Work shall be performed according to industry standards, manufacturer’s written specifications, and reference standards.

C. Porcelain Ceramic Floor Tile Applications - Thin Bed (Thin Set) Method:

1. Mixing requirements as per Mapei product requirements.

a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the concrete substrate. Comb the surface of the mortar with the notched side of the trowel. Use the proper size notched trowel for the size of tile to be installed.

3. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or “Scotch Brite™” pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.

4. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.

5. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.

6. Grouting: Provide stain resistant, colorfast, epoxy grout “Mapei”. Exposed joint widths based on manufacturer's tiles as specified herein shall be typically 1/4" wide for nominal 6" x 6" tiles and 5/16" wide for nominal 12" x 12" tiles. Note: Joint widths for use with other manufacturer’s products shall be verified with the Architect.

   a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

   b. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt. Water shall not be left standing in joints.

   c. Installation Method:

7. Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer.

8. Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.

9. Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.

10. Wash the installation within 12 to 24 hours after grouting using a detergent solution such as “Spic n Span®”, Trisodium Phosphate, “Ajax®”, “Comet®”, or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.

E. Metal Edge Trim Strips: Verify in field, height dimension of trim product in relation to thickness of the tile and/or mortar bed, and report to the General Contractor, in writing, any discrepancy detrimental to the proper installation of the product. Install specified metal edge trim angles where shown, and as detailed on the Drawings.

1. Installation: Press the perforated anchoring leg of the trim strip into the tile adhesive and align.
Trowel tile adhesive over the anchoring leg. Surface of the tile shall level with the top of the trim (the trim shall not be higher than the surface of tile, rather slightly lower – approximately 1/32"). The joint between the tile and the trim (approximately 1/32" - 1/8") shall be filled completely with grout.

F. Floor Joint Sealant: Provide control joints in floor Work where Tile Work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes and where changes occur in backing materials as detailed on the Drawings and/or required by field conditions.

3.05 MARBLE THRESHOLD INSTALLATIONS

A. Install thresholds in white dry set mortar (with latex system) similar to setting of floor tile, and point joints between marble and tile flush.

3.06 COUNTERTOP INSTALLATION

A. Adhesive Applications: Provide Epoxy Adhesive product as specified herein for installation of granite on substrate, as indicated on the Drawings.

1. Preparation:
a. Before using, store resins at room temperature (70°F+21°C+) for 24 hours to ensure ease of mixing. All surfaces must be sound, clean, free of oil, waxes, or other bond inhibiting contaminants.

b. Clean and grind back of granite at areas to receive the Epoxy Adhesive spots using a mechanical wheel grinder with a diamond wheel/blade. Remove dust with a stiff brush, wipe entire surface. Using a damp sponge (not wet), wipe the granite to remove any particles or remaining dust to ensure a clean direct bond and that all ground material is removed. Wipe dry with a clean cloth, then apply Epoxy Adhesive. NOTE: Epoxy Adhesive should not be applied to saturated or wet granite. If wetness or dampness is observed inside the granite after grinding off the top layer, the granite is saturated and must be allowed to dry out.

2. Mixing: Combine equal volumes of Epoxy Adhesive Part A and Part B (1:1 mix ratio by volume). Mix until uniform in color; no swirls. Small quantities may be mixed with a putty knife or margin trowel. Larger quantities may be mixed with an electric drill mixer (low speed).

3. Application:

a. Apply dabs evenly distributed on back of the granite as recommended by manufacturer. Finished dab thickness must be a minimum of 1/8" (3mm).

b. After installation of Epoxy Adhesive onto the substrate, install onto substrate and adjust for plumb and level.

4. Cleaning: Clean tools and Work while epoxy is fresh, using warm water. Detergent or soap may be added to the water for easier cleaning.

3.07 IMPERFECT TILE WORK

A. When directed by the Architect and prior to final acceptance of the Work, remove all broken, chipped, loose or otherwise unsatisfactory installed Tile and Countertop Work.

B. Patch and restore imperfect tile materials and workmanship to good condition satisfactory to the Architect and/or Owner.

3.08 PROTECTION

A. Protect installed Work from damage at all times during the progress of the Work.

B. Properly protect all finished Work from damage that is in place at the time this Work is being done. Tile Contractor shall be responsible, and will be required to pay for all damage to other Work caused by the Contractor’s workmen.

C. Protective covering shall be non-staining multi-purpose building paper with compatible seam tape. Product shall be such as “SealTight® Red Rosin Paper” as manufactured by

W.R. Meadows, Inc., 300 Industrial Drive, P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976, (847)214-2100; www.wrmeadows.com, or comparable equivalent product subject to review by the Architect.

3.09 CLEANING

A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site. Upon completion and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

B. When directed by the Architect, after the Work of other trades is substantially completed, remove and dispose of protective coverings and thoroughly clean all Work installed under this section. Use of acid will not be permitted. Use clean water in initial cleaning. Remove all stains, excessive mortar, etc.

C. Cleaner shall be a neutral, general, all-purpose cleaner free of acids, alkalies and abrasives such as one of the following:

1. Mira Clean #1 by Miracle Sealants Company, 12318 Lower Azusa Road, Arcadia, CA 91006-5872, (800)350-1901 or (626)443-6433.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Super Shine-All® by Hillyard, Inc., 302 North 4th. Street, P.O. Box 909, St. Joseph, MO, 64501, (816)233-1321 or (800)365-1555.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

D. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 50 00
CURVED PROFILE CEILING SUSPENSION ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
    1. Metal ceiling panels
    2. Exposed grid suspension system.
    3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
B. Related Sections:
    1. Section 09 51 00 (09510) - Acoustical Ceilings
    2. Section 09 20 00 (09250) - Plaster and Gypsum Board
    3. Divisions 23 (15) - HVAC
    4. Division 26 (16) Sections - Electrical Work
C. Alternates
    1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
    2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
    1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
    2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
    3. ASTM A 1008 "Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
    4. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
    5. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
    6. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
    7. ASTM E 1264 Classification for Acoustical Ceiling Products.

8. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 3 inch x 3 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
    1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
        a. Flame Spread: 25 or less
        b. Smoke Developed: 50 or less
C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle ceiling units carefully to avoid any distortion or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

    HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
    1. Acoustical Panels: Sagging and warping
    2. Grid System: Rusting and manufacturer's defects
B. Warranty Period:
    1. Acoustical panels: Thirty (30) years from date of substantial completion.
    2. Grid: Thirty (30) years from date of substantial completion.
    3. Acoustical panels and grid systems with HumiGuard Plus performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
    1. Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
    2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:
    1. Armstrong World Industries, Inc.
B. Suspension Systems:
    1. Armstrong World Industries, Inc.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type:
    1. Patterns:
        a. Unperforated Panel (UPA)
    2. Composition: Aluminum infill panels
    3. Color: To be selected by architect
    4. Size: (2' x 6') square edge lay-in
    5. Noise Reduction Coefficient (NRC): NA
    6. Flame Spread: Class A as per ASTM E 1264
    7. Acceptable Product: (Serpentina 3-Dimensional Ceiling System) as manufactured by Armstrong World Industries.

B. Accessories
    1. Acoustical Fleece laminated backing
    2. Infill Panel (fiberglass infill) #820-01-00

2.3 SUSPENSION SYSTEMS

A. Components: Main beams fabricated from painted commercial quality extruded aluminum and cross tees, base metal and end detail, fabricated from painted commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees have a 15/16" type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint. No visual crimp marks or punch-outs on main beams or cross tees.
    1. Color: Black
    2. Serpentina vault or hill main beams curved to 60 degree arcs, hung 24" or 48" OC; straight main beam options also available for flat ceiling applications.
    3. Butt Cut Cross Tees:
        a. SPTB7328: 2 foot, 15/16 inch flange
        b. SPTB7520: 2 foot, 9/16 inch flange
    4. Corner Post (SPTOSCP): Pre-assembled corner
    5. Cross Tee Connector Clip (AXCCLT): Twist-in clip with pre-punched holes for attachment of cross tees to perimeter trim
    6. Semi-Concealed Components:
        a. Inner Module Connector (SCXT24MR): Connector tee between two main runners.
        b. Outer Module Connector (SCXT24SPT): Connector tee between main runner and perimeter trim.
        c. Outer-to-Outer Module Connector (SCXT24SPT2): Connector tee is connection between two pieces of perimeter trim.
        d. Speed Clip: Used to splice two semi-concealed panels together.
    7. Strong Back: Used for aid stability and squaring of the system during installation. Also eliminates hanger wires on perimeter cross tees. Note: Hanger wires are still to be attached to the main runners, not the StrongBack
B. Edge Moldings and Trim:
    1. Extruded aluminum perimeter "J" moldings (SJMS - Serpentina J Molding for shallow arcs & SJMT - Serpentina J Molding for tight arcs).
    2. For floating ceiling applications, use Serpentina Perimeter Trim (SPT) optionally.
C. Accessories: Serpentina Hold Down Clips (#SPTCHDC) used as necessary to hold infill panels flush with suspension system.
D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
E. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
    1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's installation instructions, LA 295589 and in compliance with ASTM C 636 and with the authorities having jurisdiction.
B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.
C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
D. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 Description of Work

A. Related work specified elsewhere:
1. Section 09260/09 21 16 - Gypsum Board Assemblies

1.02 References

A. ASTM A653/A653m - Standard Specification for Sheet Steel, Zinc-coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
B. ASTM C423 - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
C. ASTM C635 - Manufacturing of Metal Suspension Systems
D. ASTM C636 - Installation of Metal Suspension Systems in Non-seismic Applications
E. ASTM D2486 - Standard Test Methods for Scrub Resistance
F. ASTM D3273 - Resistance to Growth of Mold of Interior Coatings in an Environmental Chamber
G. ASTM D3273-00 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
H. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
I. ASTM D4828 - Standard Test Methods for Practical Washability
J. ASTM D5116-06 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/ Products
K. ASTM E84 - Surface Burning Characteristics of Building Materials
L. ASTM E119 - Fire Tests of Building Construction and Materials
M. ASTM E580 - Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
N. ASTM E1264 - Classification for Acoustical Ceiling Products
O. ASTM E1414 - Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
P. CISCA Ceiling Systems Installation Handbook.
Q. NFPA 70 - 2008 National Electrical Code (NEC) Section 410-36
R. Fire-response tests are performed by a testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
S. Fire-resistance-rated, acoustical tile ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
T. CHPS - Collaborative for High-Performance Schools Indoor air quality emission testing of materials.
U. COEHHA - The California Office of Environmental Health Hazard Assessment established exposure limits of chemicals.

V. High Recycled Content (HRC) - Classified as containing greater than fifty percent total recycled content. Total recycled content is based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

1.03 Submittals

A. Coordination drawings: Submit reflected ceiling plans that are coordinated with mechanical, electrical and security work at acoustical ceilings. Show ceiling suspension members, method of anchorage of hangers and ceiling mounted work including light fixtures and air grilles.
B. 6"x6" (min.) samples of each tile type, pattern, and color required.
C. Set of 12-inch- long samples of suspension system members.
D. Set of 12-inch- long samples of exposed moldings for each color and system type required.
E. Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements and warranties.

1.04 Delivery, Storage and Handling of Materials

A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. B. Storage:
    1. Panels: Storage time of materials at the job site should be as short as possible, and environmental conditions should be as near as possible to those specified for occupancy (see no. 1.05 below). Excess humidity during storage can cause expansion of material and possible warp, sag, or poor fit after installation. Chemical changes in the mat and/or coatings can be aggravated by excess humidity and cause discoloration during storage, even in unopened cartons. Cartons should be removed from pallets and stringers to prevent distortion of material. Long-term (6- 12 months) storage under uncontrolled environmental conditions should be avoided.
    2. Suspension System: Store in manner that will prevent warping, scratches, or damage of any kind.
C. Handling: Handle in such manner to ensure against racking, distortion, or physical damage of any kind.
D. Damaged or deteriorated materials should be removed from the premises.
Immediately before installation, to stabilize tile and panels, store them at a location where temperature and humidity conditions duplicate those ambient during installation and anticipated for occupancy.

1.05 Environmental Conditions

A. Installation of acoustical panels shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete, or terrazzo work has dissipated.
B. Do not use ceiling panels in extreme or continuous high humidity, or areas exposed directly to weather or water. Ceiling panels are sized and designed for use within the standard occupancy range of temperature and humidity, 65-85 °F (18-29 °C), no more than 70% RH (relative humidity). Humidity can greatly affect product dimensional stability and sag resistance. Sag can become noticeable during periods of high humidity lasting only a few hours. CLIMAPLUS ceilings if used with DONN® Brand Suspension Systems, can withstand temperatures from 60-104 °F (32-40 °C) and relative humidity up to 95%-100% RH. See USG Interiors Inc. for specific warranty information.

C. Allow time for dimensional changes in ceiling panels stored at temperature/humidity conditions well outside of those recommended for service.

With increases in temperature/humidity, these products expand (up to 1/64 in./ft. (4.3 mm/m) at 85 °F (29 °C)/90% RH) and may not fit into a fixed grid. Conversely, with decreases, these products will be undersize, but expand to normal when standard ambient conditions return.

D. Formaldehyde & VOC Classification, as tested per ASTM D5116 and according to standards established by the Collaborative for High-Performance Schools (CHPS), the California Office of Environmental Health Hazard Assessment (OEHHA), and the USGBC LEED for Schools.
   1. Products are classified as zero- or low-emitting for formaldehyde and VOC emissions as defined:
      a. “Zero-Emitting” - Materials producing concentration levels below the test-chamber background level specified by the "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 addendum. Section 3.8.4.3 states, " Background concentrations in the empty chamber ventilated at 1.0 air changes per hour shall not exceed 2 µg m-3 (1.6 ppb) for any individual VOC, including formaldehyde" and all VOCs with chronic inhalation Reference Exposure Levels adopted by California EPA COEHHA for Proposition 65 chemicals.
      b. ”Low-Emitting” - Materials passing CHPS requirements as established in the "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 addendum. In addition, these products produce formaldehyde concentration levels below 16.5 µg m-3 (13.5 ppb) & contribute no more than one-half of the chronic inhalation Reference Exposure Level adopted by California EPA COEHHA for all other VOCs identified by Proposition 65.
   2. Must be tested by independent lab per these standards along with product submittals.
      a. Documentation of laboratory test must indicate products and item number if test results differ for other facility manufacturing location for supplied products.
   3. Acceptable products must be listed on the Collaborative for HighPerformance Schools (CHPS) website found at http://www.chps.net/dev/Drupal/node/445.
   4. If only select item numbers within a product family or products formulated in select manufacturing facilities meet the CHPS requirements and are listed on the CHPS website, product literature and samples must clearly indicate that the product meets either zero- or low-emitting standards per the CHPS test protocol. In instances where only select items from a manufacturer meet the CHPS protocol, product packaging or labeling must clearly indicate the product meets the minimum requirements of the CHPS test standard for zero- or low-emitting Products as defined in Section 01350.

1.06 Quality Assurance

A. Single Source Responsibility: To obtain combined warranty for the Donn Brand suspension system and the acoustical panel, color match or ceiling panel and suspension system compatibility, all acoustical panel and suspension system components shall be produced and supplied by one manufacturer. Materials supplied by more than one manufacturer are not acceptable.
B. Subcontractor qualifications: Installer shall have successful experience in the installation of suspended ceiling systems on projects with requirements similar to requirements specified.
C. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.

D. Source quality control:
   1. Test reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.
   2. Changes from system: System performance following any substitution of materials or change in assembly design must be certified by the manufacturer.
   3. All ceiling panel cartons must contain UL label for acoustical compliance.
   4. All suspension system cartons must contain UL label for load compliance per ASTM C635.

1.07 Project Conditions

A. Existing conditions: (include specific alteration work requirements for project).
   1. Environmental requirements for interior installation: Building shall be enclosed with windows and exterior doors in place and glazed, and roof watertight before installation of ceiling system and related ceiling components. 1. Describe ClimaPlus condition C. Coordination with other work:
   2. General: Coordinate with other work supported by or penetrating through the ceiling, including mechanical and electrical work and partition systems.
   3. Mechanical work: Ductwork above ceiling shall be complete, and permanent heating and cooling systems operating to climate conditions prior to installation of ceiling components.
   4. Electrical work: Installation of conduit above ceiling shall be complete before installation of ceiling components.
   5. Fire protection work: Fire protection lines and/or equipment occurring above ceiling shall be completed and tested before ceiling components are installed. D. Protection:
      1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate personal protective equipment as needed. Read material safety data sheets and related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.
      2. Protect completed work above ceiling system from damage during installation of ceiling components.

PART 2 - PRODUCTS

2.01 Materials

A. ACP Spec 1. Acoustical Ceiling Panel
   a. Water Felted, Mineral-Base with painted finish Acoustical Panels for acoustical ceiling panel.
      1. Available Product: USG Corporation "Radar™" - Item Number 2210
   b. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
      1. Type III, Form 2, Pattern CDE
      2. Surface Burning Characteristics: Class A, Flame Spread 25, Smoke Developed 50
   c. Color Finish: White

d. Recycled Content: Not Less Than 36.5
e. NRC Rating: Not Less Than 0.55
f. CAC Rating: Not Less Than 33
g. LR Rating: Not Less Than 0.84
h. Edge Detail: Reveal sized to fit flange of exposed suspension system members: Square Edge
i. Thickness: 5/8 in
j. Panel Size: 2 ft x 2 ft x 5/8 in
k. Antimicrobial Treatment: Coating based.
l. Formaldehyde and VOC Classification: Low producing concentration levels below the test-chamber background level as defined by CHPS, and OEHHA referenced in Section 09 51 13 1.05.E.
m. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.

B. ACP Spec 2 Acoustical Ceiling Panel

2. Acoustical Ceiling Panel

a. Gypsum Core, vinyl-laminated gypsum panels for acoustical ceiling panels
    1. Available Product: USG Corporation "SHEETROCK® Lay-In Ceiling Panel ClimaPlus™" - Item Number 3260
b. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
    1. Pattern G, Type XX
    2. Surface Burning Characteristics: Firecode, Flame Spread 25, Smoke Developed 50
c. Color Finish: White
d. Recycled Content: Not Less Than 23
e. NRC Rating: Not Applicable
f. CAC Rating: Not Less Than 35
g. LR Rating: Not Less Than 0.77
h. Edge Detail: Reveal sized to fit flange of exposed suspension system members: Square Edge
i. Thickness: 1/2 in
j. Panel Size: 2 ft x 2 ft x 1/2 in
k. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.Panel Warranty: When used with a USG Donn Brand suspension system,
l. this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.

2. Metal Suspension System for Acoustical Ceiling Panel
    a. General: ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish; color: Flat White #050 or as selected from manufacturer's standard colors. Flat White 050
    b. Available Products/ Systems:
        1. USG Corporation: USG DONN® Brand DX®/DXL™ 15/16" Acoustical Suspension System
    c. Suspension System Components:
        1. Fire Rated Main Tees: UL Classified Intermediate Duty Classification; double-web design; 1.64 in. high; rectangular top bulb; 15/16 in. exposed flange with roll-formed steel cap; cross tee holes and hanger wire holes at 6 in. o.c.; convenience holes at approximately 2 in. o.c.; integral reversible splices.
        2. Cross tee: 1-1/2 in. high; roll-formed into double-web design with rectangular bulb; 15/16 in. exposed flange with prepainted steel cap; high tensile steel end clips clenched to web. 1 in. high; roll-formed into double-web design with rectangular bulb; 15/16 in. exposed flange with prepainted steel cap; high tensile steel end clips clenched to web. Main tees and cross tees shall be positively locked, yet shall be removable without the use of tools.
    d. Accessories:
        1. Wall Molding: Angle shape; 7/8 in. mounting flange by 7/8 in. face flange or 1 in. mounting flange by 2 in. face flange or 2 in. mounting flange or 2 in. face flange; hemmed edges; exposed surface pre-finished to match suspension system components.
            I. Inside Corner: Field-mitered joints at wall molding; Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
            II. Outside Corner: Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
        2. Channel Molding: U-shape; hemmed edges; exposed surfaces pre-finished to match suspension system components; 1" or 1/2" exposed flange by depth as required for ceiling material
    e. Suspension System Attachment devices
        1. Hanger Wire: Galvanized carbon steel; soft temper; prestretched; yield stress load at least three times the design load but not less than 12-gauge.
    f. Suspension System Warranty: When used with a USG acoustical ceiling panel, this suspension system has a Lifetime 30 year warranty that it shall be free from the occurrence of 50% red rust. When used without a USG acoustical ceiling panel, the period of warranty is 10 years.

2.02 Fabrication

A. Trim: Edges extruded to mate with attachment clips and provide positive mechanical lock with no visible fasteners. Factory finished to match approved samples.
B. Splice Plates: Formed to screw into and provide positive lock between abutting pans with no visible fasteners. Factory finished to match trim.

C. Mounting Clips: Formed to screw-attach to trim and provide positive mechanical lock with no visible fasteners while providing a variable angle, screw-fastened connection to suspension members which intersect the trim.

PART 3 - EXECUTION

3.01 General

A. Standard for Ceiling Suspension System Installations: Comply with ASTM C636.
B. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
C. CISCA Ceilings Systems Handbook.
D. NFPA 70 – 2008 National Electrical Code (NEC) Section 410-36.
E. All applicable local and state codes.

3.02 Inspection

A. Examine areas to receive ceiling panels for conditions that will adversely affect installation. Provide written report of discrepancies.
B. Do not start work until unsatisfactory conditions are corrected.
C. Work to be concealed: Verify work above ceiling is complete and installed in manner that will not affect layout and installation of ceiling panels.
D. Beginning of installation shall signify acceptance of conditions in areas to receive ceiling panels.
E. Fire-rating requirements: Construction above fire-rated assembly shall meet requirements of UL Design specified in *2: Products.*

3.03 Preparation

A. Field dimensions: Installer must verify actual field dimensions prior to installation.
B. Renovation work: Installing contractor shall verify that existing ceiling structure is adequate to support additional Compasso ceiling suspension requirement.
C. Coordination: Coordinate and schedule installation of ceiling system with work of other trades affected by this installation, with particular attention given to mechanical and electrical work required to be installed and operating before ceiling work can begin.

3.05 Field Quality Control

A. Deflection on installed system: Maximum deflection shall not exceed 1/360 of the span.

3.06 Cleaning

A. Suspension System: Remove panel material and perform any necessary cleaning maintenance with non-solvent based commercial cleaner
B. Immediately remove any corrosive substances or chemicals that would attack painted finishes (i.e. wallpaper adhesives)
C. Touch up all minor scratches and spots, as acceptable, or replace damaged sections when touch-up is not permitted

D. Painting: Repainting of suspension member shall be with a high-quality solvent base enamel paint and applied as recommended by paint manufacturer. Ceiling panels may be touched-up by spraying a thinned, non-bridging vinyl-acrylic flat wall paint. The type of paint selected and the method of application can alter the acoustical performance and fire ratings of any acoustical product. Therefore, USG Interiors, Inc. cannot guarantee that the field-painted panels will match the published performance.

E. Removal of debris: Remove all debris resulting from work of this section.

END OF SECTION

SECTION 09 65 13
RESILIENT BASE (RB)

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish labor, materials, tools, equipment, and services for Resilient Base (RB), as indicated, in accordance with provisions of Contract Documents.

B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

A. ASTM International (ASTM):
   1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
   2. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
   3. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
   4. ASTM F1861 Standard Specification for Resilient Wall Base

B. National Fire Protection Association (NFPA):
   1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
   2. NFPA 258 Recommended Practice for Determining Smoke Generation of Solid Materials

C. Thermoplastic Rubber: Type TP.

D. Critical Radiant Flux:
   1. Class I, not less than 0.45 W/cm2.

E. Flame Spread: Maximum, 75.

F. Smoke Developed: Maximum, 250.

1.3 SUBMITTALS

A. Samples:
   1. Resilient Base:
      a. Three samples of material and color as specified in Drawing I-001 Interior Notes and Finish Legend.
   2. Field fabricated corners: Construct sample base inside and outside corner:
      a. Include minimum 4 FT straight base each direction from corner.
      b. If not acceptable construct additional corners.
         1) Stress whitening and cracking will not be acceptable.
         2) Color and height variation will not be acceptable.
      c. Sample corners constitute standard of quality for actual construction.
      d. Maintain sample corners during construction.
      e. Remove when directed.

f. Sample corners may be built into permanent construction provided sample area is readily identifiable during construction.
g. Do not proceed with base installation until sample corners are approved by Architect.

B. Contract Closeout Information:
1. Warranty.
2. Maintenance data:
a. See Section 01 78 23.

1.4 WARRANTY

A. Manufacturer's standard warranty..

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Resilient Base (RB):
1. Base:
a. Roppe
2. Optional
a. Johnsonite.
b. Burke

B. Other manufacturers desiring approval comply with Section 00 26 00.

2.2 MATERIALS

A. Resilient Base (RB-1):
~~1.~~ Roppe 4" Color: 175 Slate. Standard Toe base
2. 1/8 x 4 IN
3. Color: Dolphin 129
4. Factory formed external and internal corners.
5. Provide continuous rolls, minimum 95 FT long

B. Contoured resilient base:

C. Leveling compound: As recommended by manufacturer, compatible with adhesives.

D. Adhesives and primers:
1. As recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces for defects and irregularities.

B. Verify substrates are free of materials that may affect adhesion.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

D. Installation indicates acceptance of substrates and responsibility for performance.

3.2 PREPARATION

A. Fill cracks, joints, etc., with water resistant non-crumbling patching compound.

B. Trowel to smooth and proper level.

3.3 INSTALLATION

A. Install after wall finishes.

B. Install prior to carpet and acoustical material.

C. Prepare substrate in accordance with manufacturer's instructions.

D. Protect adjacent work from damage.

E. Schedule installation to minimize accumulation of air contaminants that cannot be removed prior to occupancy.

F. Install base after wall material has dried out thoroughly.
   1. Provide base at intersections of floor and vertical surfaces in areas scheduled to receive base, where intersection is exposed to view.
   2. Apply primer and adhesive as recommended by manufacturer.
   3. Set base straight and true.
   4. Fit base neatly into breaks and recesses.
   5. Install corners as recommended by manufacturer.
   6. Scribe to trim at door frames.
   7. Make joints tight.
   8. Install with top and bottom edges in firm contact with wall and floor.

3.4 CLEANING

A. Remove surplus adhesive immediately after application and rolling.

B. Clean in accordance with manufacturer's recommendations after materials have sufficiently seated.

END OF SECTION

SECTION 09 80 00
SPECIAL COATINGS

PART I GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Definitions: Elastomeric polyurea lining includes a penetrating, two-component, epoxy primer and a spray applied, high build, polyurea-polyurethane elastomeric coating.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, installation instructions, and chemical resistance data for the elastomeric polymer lining. Include certification indicating compliance of materials with requirements.

B. Samples: Submit, for verification purposes, 4-inch square samples of each type of elastomeric polyurea lining required, applied to a rigid backing, in color and finish indicated.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain primary lining materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Stonhard or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

B. Pre-Installation Conference

1. General Contractor shall arrange a meeting not less than thirty days prior to starting work.

2. Attendance

a. General Contractor

b. Architect/Owner's Representative

c. Manufacturer/Installer's Representative

1.05 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered to job site and checked by lining manufacturer for completeness and shipping damage prior to job start.

B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches.

C. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 50 to 90^{o}F/10 to 32^{o}C.

1.06 PROJECT CONDITIONS

A. Concrete substrate shall be dense, free of voids, fins, honeycombs and other imperfections. Horizontal surfaces shall have a “once over” steel trowel finish (wood float, broom or machine trowel finishes are unacceptable). Finish concrete to the required grade, less allowance for overlayment thickness. A vapor barrier shall be present for concrete on or below grade to prevent osmotic pressure forces from affecting adhesion of overlayment. Cure concrete 30 days minimum and conduct the following tests prior to application of overlayment:

1. Test for “bird baths,” if complete drainage is critical, by flooding horizontal surfaces with water and marking unacceptable areas. Unacceptable areas are to be corrected prior to application of overlayment.
2. Test for unacceptable moisture content in concrete by the “plastic sheet” method (Ref. ASTM D-4263). The number of test sites shall be representative of the scope of work.
3. Test for acceptable concrete surface tensile strength of 200 psi minimum by using a “pull-out test” (Ref. ASTM D-7234) in which a 1.0 inch diameter hole is cut into the concrete. Using a polymer adhesive, glue a 0.8 inch diameter dolly to the area cut in the concrete. The number of test sites shall be representative of the scope of work.
4. All patching and repair materials must be compatible with the overlayment and must be tested for acceptable surface tensile strength of 200 psi minimum by using “pull-out test” (Ref. A.3. above). The number of test sites shall be representative of the scope of work.
5. Test for substrate temperature by using a surface dial thermometer or equal. Temperature shall be within temperature parameters recommended by the lining material manufacturer.

6. Inspect for contamination, such as oil, grease, or chemical spills. Contamination must be removed prior to application of lining.

B. Utilities, including electric, water, and finished lighting to be supplied by General Contractor.

C. Job area to be free of other trades during, and for a period of 8 hours, after lining installation.

D. Protection of finished lining from damage by subsequent trades shall be the responsibility of the General Contractor.

1.07 PROJECT CONTROL

A. Manufacturer shall be responsible for supervising and controlling the installation of the special coatings covered by this specification.

1.08 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

PART II PRODUCTS

2.01 COLORS

A. Colors: Available in manufacturer's light gray.

2.02 ELASTOMERIC POLYUREA-POLYURETHANE LINING SYSTEM

A. The elastomeric polyurea-polyurethane lining system shall be Stonchem 441 as manufactured by Stonhard, Maple Shade, NJ, (800) 257-7953, www.stonhard.com, comprised of a penetrating two-component epoxy primer and a two-component, high build, polyurea-polyurethane elastomeric lining. Contact: scronin@stonhard.com 281 253 5125

1. The polyurea-polyurethane elastomer shall be formed by reacting an amine and hydroxyl terminated resin with an isocyanate. The reacted polyurea-polyurethane elastomer shall have the following application properties.

a. Gel Time 1 hour

b. Cured for foot traffic 5 hours

2. Physical Properties: Provide lining system in which physical properties of topping, when tested in accordance with standards or procedures referenced below, are as follows:

Tensile Strength	**2,700 psi**
(ASTM D-638)	
Hardness	**50**
(ASTM D-2240, Shore D)	
Bond Strength	**>400 psi**
(ASTM D-7234)	**(100% concrete failure)**
Abrasion Resistance	**0.035 gm max. weight loss**
(ASTM D-4060, CS-17)	
Elongation	**125%**
(ASTM D-638)	
Tack Free Time	**1 hour**
(@ 70°F/21°C)	
Low Temperature Flexibility Test	**-20°F/-29°C Pass**
(ASTM D-522)	
Coefficient of Friction	**0.9 dry**
(ASTM F-1679)	
Cure Rate	**1 hour tack free**
(@ 70°F/21°C)	**5 hours for foot traffic**
	24 hours for chemical service

2.03 ENGINEERING DETAILS

A. POINTS OF TERMINATION

1. Edges shall be chased to “lock” the lining into the concrete.
2. Tank perimeters shall be treated in one of three methods as specified by the Owner prior to bid:
   a. Lining shall terminate at tank perimeter without sealing perimeter edge, to allow detection of leaks that may occur under the tank.
   b. Lining shall terminate at tank perimeter with a compatible elastomer sealing the interface between the lining and the tank.
   c. Lining shall lap and seal onto the perimeter of the tank by bridging over compatible elastomer at the tank/slab interface to compensate for possible movement.

3. Equipment support legs shall be treated in one of the two methods described in 2.b. or 2.c. above as specified by the Owner prior to bid.

4. Trench drains shall be treated in one of three methods as specified by the Owner prior to bid:

    a. Steel angle trench lip must be anchored to prevent movement between the steel and concrete. Lining shall be chased to "lock" the lining where it terminates at the angle. Steel angle will be coated with the lining system or a material compatible with the lining material or will remain uncoated at Owner's option.

    b. Prefabricated polymer or alloy trenches must be anchored to prevent movement between the concrete and trench. Lining shall be chased to "lock" the lining where it terminates at the trench.

    c. Concrete trench will be lined to maintain monolithic protection. "Cold Joint" will be treated by lining manufacturer to assure bridging of potential cracks.

5. Pipe drains shall be treated by chasing the lining to "lock" in place at point of termination. Pipe drain must be anchored to prevent movement between concrete and trench.

6. Pipe chases shall be treated by having the lining lap and seal onto the perimeter of the pipe chase.

B. JOINTS AND CRACKS

1. Control joints shall be treated by lining manufacturer to assure bridging of potential cracks and to maintain monolithic protection.

2. Cold joints or construction joints shall be treated by lining manufacturers to assure bridging potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

3. Vertical and horizontal expansion/contraction joints shall be treated by installing backer rod and compatible sealant before lining is installed to assure bridging of joint movement and to maintain monolithic protection.

4. Cracks in vertical or horizontal concrete substrates shall be treated by lining manufacturer to assure bridging of cracks and to maintain monolithic protection.

C. CORNERS

1. Inside corners shall be treated with either an elastomeric or epoxy mortar radius (½" minimum) prior to application of the lining.

2. Outside corners shall be ground to remove sharp corners as part of surface preparation.

PART III EXECUTION

3.01 SPRAY EQUIPMENT

A. The type and condition of the spray equipment is critical to produce a high quality polyurea lining with the proper physical properties. Use of any spray equipment which does not comply with this section of the specification is strictly prohibited without the written approval of an authorized technical representative.

B. Spray pump and heating unit shall be WIWA Duo Mix 230, as manufactured by WIWA Wilhelm Wagner LP, 3734A Cook Blvd, Chesapeake, VA 23323, (757) 436-2223. Other manufacturer models may be acceptable for specific projects subject to written approval by the Stonhard Technical Service Department.

C. Spray gun shall be a WIWA 500F Airless as manufactured by WIWA Wilhelm Wagner LP.

D. Spray gun shall have one port of entry for the mixed two-component lining system. The spray gun shall be fed by a ¼" swiveling WHIP hose that contains mixed material.

3.02 ADDITIONAL REQUIREMENTS

A. Drum heaters are required to heat material if material temperature is below 65°F/18°C.

B. The following minimum services shall be provided to run the spray equipment and heaters:

1. Electric: Single phase, 110 or 220 volt
2. Compressed Air: 185 CFM @ 90 psi, treated to assure dry air supply. Moist air is unacceptable.

3.03 PREPARATION

A. Substrate: Concrete preparation shall be by mechanical means and may include use of a scabbler, scarifier, shot blast, sand blast, water blast or sand injected water blast machine for removal of bond inhibiting materials such as curing compounds or laitance. Outside corners shall be ground to remove sharp corners. Route all cracks and joints to form a "V" groove.

B. Surrounding steel preparation shall be abrasive blasted to near white metal, according to SSPC-SP10.

3.04 APPLICATION

A. General: Apply each component of elastomeric polyurea-polyurethane lining system in compliance with manufacturer's directions to produce a uniform monolithic lining of the thickness indicated.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.

C. Bug Hole Filler: Mix and apply bug hole filler as part of the priming in strict accordance with manufacturer's installation procedure.

D. Inside Radius: Mix and apply radius filler material forming a minimum ½" radius in strict accordance with manufacturer's installation procedures.

E. Cracks & Joints: Fill all cracks and joints with compatible elastomeric filler material in strict accordance with manufacturer's instructions.

F. Lining: Spray apply elastomeric polyurea lining at a 2:1 ratio over properly cured primer with strict adherence to manufacturer's installation procedures including but not limited to:

1. Primary Heat: 90 - 100°F/°C
2. Hose Heat: 125°F/°C
3. Spray Pressure: 2,000 – 2,300 psi with no greater than 300 psi pressure differential between sides

3.05 FIELD QUALITY CONTROL

A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of lining application.

B. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

C. Testing laboratory will perform tests for any of the characteristics specified, using applicable testing procedures referenced herein, or if none are referenced, in manufacturer's product data.

D. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply lining materials to properly prepared surfaces which had previously been coated with unacceptable materials.

E. Thickness Test: Apply polyurea-polyurethane lining material onto a polyethylene board with the number of spray gun passes to be used during installation. After the material cures for a few minutes, remove the material from the board and measure thickness. If thickness is not within the nominal specified range, adjust number of spray gun passes and repeat test.

F. Retained Field Samples: Return field samples used for thickness test to lining manufacturer, who shall retain samples as part of the manufacturer's project record.

3.06 CURING, PROTECTION AND CLEANING

A. Cure elastomeric polyurea-polyurethane lining system in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 1 hour.

B. Protect elastomeric polyurea-polyurethane lining system from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean elastomeric polyurea-polyurethane lining system just prior to final inspection. Use cleaning materials and procedures recommended by resinous lining manufacturer.

END OF SECTION

SECTION 09 81 00
ACOUSTIC INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Formaldehyde-free™ fiberglass Sound control insulation.
Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Division 7 Section: Roof Deck Insulation.

2. Division 7 Section: Joint Sealants.

3. Division 9 Section: Gypsum Board.

4. Division 9 Section: Acoustical Ceilings.

5. Division 15 Section: Mechanical: Duct insulation, Equipment insulation And Pipe insulation.

1.02 REFERENCES

A. ASTM International:

1. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations.

2. ASTM C356 Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.

3. ASTM C411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

4. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

5. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

6. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

7. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

8. ASTM C764 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.

9. ASTM C1014 Standard Specification for Spray-Applied Mineral Fiber Thermal and Sound Absorbing Insulation.

10. ASTM C1015 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.

11. ASTM C1104 Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

12. ASTM C1149 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation

13. ASTM C1304 Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials.

14. ASTM C1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

15. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

16. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

17. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

18. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

19. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.

20. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

21. ASTM E736 Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

22. ASTM E759 Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.

23. ASTM E970 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide batt Insulation that have been manufactured, fabricated and installed to the following criteria:

1. Surface Burning Characteristics, Unfaced (ASTM E84): Flamespread index 25, smoke developed 50.

2. Combustibility (ASTM E136): Noncombustible.

3. Formaldehyde Content: Free of formaldehyde.

4. Assembly Fire Resistance Rating (ASTM E119): As shown in dwgs.

5. Assembly Sound Transmission Rating (ASTM E90): Refer product specifications.

6. Sound Absorption (ASTM C423): Refer product specifications.

7. Thermal Performance (ASTM C518): R11

1.04 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C General: Submit listed submittals in accordance with provisions of Section 01300 Administrative Requirements.

D. Product Data: Submit manufacturer’s product data and installation instructions, including manufacturer’s SPEC-DATA® sheets.

E. Samples: Submit manufacturer’s standard selection and verification samples.

F. Quality Assurance/Control Submittals: Submit the following:

1. Test Reports: Upon request, submit Fire, Sound And Therma] test reports from recognized test laboratories.

2. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Obtain each type of building insulation through a single source.

B. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

C. Pre-installation Meetings: Refer Division One Specifications.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS:

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 FORMALDEHYDE-FREE™™ BUILDING INSULATION

A. Manufacturer: Johns Manville.

1. Contact: 717 17th Street 80202; PO Box 5108, Denver, CO 80217-5108; Telephone: (800) 654-3103; Fax: (303) 978-2318; E-mail: pic@jm.com; website: www.specJM.com.

B. Proprietary Products/Systems: Building insulation, including the following:

1. JM Formaldehyde-free™ ComfortTherm® Poly-Encapsulated Batts:

a. Thermal Resistance (R-Value) (ASTM C518): R-11

b. Combustion Characteristics (ASTM E136): Pass.

c. Critical Radiant Flux (ASTM E970): Greater than 0.11 Btu/ft^2 × s (0.12 W/cm^2).

d. Water Vapor Permeance (ASTM E96): 0.5 perm (30 ng/Pa × s × m^2).

e. Water Vapor Sorption (ASTM C1104): 5% or less by weight.

f. Odor Emission (ASTM C1304): Pass.

g. Corrosiveness (ASTM C665, 13.8): Pass.

h. Fungi Resistance (ASTM C1338): Pass.

i. Recycled Content: Certified by Scientific Certification Systems to contain minimum of 20% post-consumer and 5% pre-consumer recycled glass product, on average of manufacturer's products.

j. Prove through documentation that product passes CIWMB Section 01350 for indoor air quality.

k. Thickness: 3 ½ "

l. Flamespread (ASTM E84): 25, maximum.

m. Smoke Developed (ASTM E84): 50, maximum.

n. Material Standard: ASTM C665, Type II, Class A (membrane-faced surface with a flamespread of 25 or less), Category 1 (membrane is a vapor barrier).

2.03 ACCESSORIES

A. Tape: Self-adhesive vapor retarder tape with flame spread index of 25 or less, smoke developed index of 50 or less.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the building insulation manufacturer.

3.02 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of building insulation.

2. Do not proceed with installation of building insulation until unacceptable conditions are corrected.

B. Refer to Section 01 31 00 – Project Management & Coordination

C. Refer to Section 01 73 00 – Execution

3.03 PREPARATION

A. Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.04 INSTALLATION

A. General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.

1. Install insulation that is undamaged, dry and unsoiled and that has not been left exposed at any time to ice and snow.

2. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.

3. Water Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

4. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

B. Installation of General Building Insulation:

1. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic or sealant as recommended by insulation manufacturer.

2. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
   a. Tape ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

3. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:

   a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

   b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

   c. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

4. Wood-Framed Construction: Install mineral-fiber blankets in accordance with ASTM C1320 and as follows:

   a. With faced blankets having stapling flanges, secure insulation by friction fit inset or face stapling flanges to sides of framing members.

   b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

5. Acoustical Insulation Installation: Install insulation where indicated in sound rated assemblies. Maintain acoustical rating of assembly.

6. Board Insulation Installation: Install insulation where indicated:

   a. Cut and friction fit insulation between vertical or Z-shaped framing.

   b. Alternatively install insulation on impaling pins or with suitable adhesives.

c. Place pins 3 inches - 5 inches (76 - 127 mm) from edges of insulation.

7. Loose-Fill Insulation: Place loose-fill insulation into spaces and onto surfaces as shown, by machine blowing to comply with ASTM C1015. Level horizontal applications to uniform thickness as indicated. Hold insulation back from air vents, flues and heat-generating appliances.

E. Installation of Vapor Retarders:

1. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

2. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

3. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape to create an airtight seal between penetrating objects and vapor retarder.

4. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor retarder tape or another layer of vapor retarder.

3.05 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site. Repair damage to installed products prior to installation of finish materials.

3.06 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 90 01
PAINTS AND COATINGS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available. Sherwin Williams Coatings listed at the end of this specification where used to establish the level of quality of the coating systems. The coating manufacturer shall match the colors identified in the finish schedule.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Pre-finished items not to be painted include the following factory-finished components:

a. Acoustic materials.

b. Finished mechanical and electrical equipment.

c. Light fixtures.

d. Switchgear.

e. Distribution cabinets.

f. Plastic laminate wood doors.

g. Wood veneer doors

h. Metal lockers.

i. Plastic laminate covered architectural casework.

j. Wood veneer woodwork and casework.

k. Metal flashings.

l. Curtain wall system.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

a. Furred areas.

b. Pipe spaces.

c. Ceiling plenums, with the following exception:

3. Finished metal surfaces not to be painted include:

a. Anodized aluminum.

b. Stainless steel.

c. Chromium plate.

d. Copper.

e. Bronze or brass.

4. Operating parts not to be painted include moving parts of operating equipment such as the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED SECTIONS: The following items of related Work will be provided under other sections of the Specifications:

A. Section 01 35 45 - Sustainable Design Project Requirements.

B. Section 01 74 19 - Construction Waste Management

C. Section 05 12 00 - Structural Steel Framing: Shop Primed Items.

D. Section 05 21 00 - Steel Joist Framing: Shop Primed Items.

E. Section 05 50 00 - Metal Fabrications: Shop Primed Items.

F Section 05 51 00 - Metal Stairs: Shop Primed, Field Painted.

G. Section 08 12 14 - Standard Steel Frames: Shop Primed, Field Painted.

H. Section 08 13 14 - Standard Steel Doors: Shop Primed, Field Painted.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

J. Section 23 05 53 - Identification for HVAC Piping and Equipment.

K. Section 26 05 53 - Identification for Electrical Systems.

L. Section 27 05 53 - Identification for Communication Systems.

M. Section 05 05 13 - Shop Applied Coatings for Metal

N. Section 06 01 40 - Architectural Woodwork Refinishing

O. Section 06 05 83 - Shop Applied Wood Coatings

P. Section 07 19 00 - Water Repellents.

Q. Section 09 67 00 - Fluid Applied Flooring for Concrete

R. Section 09 93 00 - Stains and Transparent Finishes

S. Section 09 96 00 - High-Performance Coatings

1.03 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning

B. SSPC-SP 2 - Hand Tool Cleaning

C. SSPC-SP 3 - Power Tool Cleaning

D. SSPC-SP 13 / Nace No. 6 Surface Preparation for Concrete

E. EPA-Method 24

F. GS-11, GC-03

1.04 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Submit, in accordance with, Section 01 33 00 – Submittal Procedures.

C. Product Data: Manufacturer's technical information, label analysis, application instructions and MSDS sheets for each material proposed for use.

1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

2. Provide Material Safety and Data Sheets on each product specified.

D. Samples: Upon selection of colors by the architect, submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

1. On 12" x 12" hardboard, provide one sample of each paint color listed in the color schedule, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved. Samples shall be steeped to show primer, first coat, and second coat.

2. On actual wood surfaces, provide two 4" x 8" samples of stained wood finish.

3. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples when requested by Architect. On at least 100 sq. ft. of surface as directed, provide full-coat finish samples until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

4. Do not proceed with painting until materials and finishes are approved by Architect.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of problems anticipated using the materials specified.

C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.

2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.

3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.

D. Interior coating type: Provide interior painting systems which are VOC compliant as per Green Seal Environmental Standard GS-11 for interior paint VOC thresholds:

1. Non-flat: VOC not more than 50 g/L.

2. Flat: VOC not more than 50 g/L.

E. Interior/Exterior coatings type: Provide interior/exterior coating systems which are VOC compliant as per Rule 1168 of the South Coast Air Quality Management District for coatings, primers, stains:

1. Primers, Sealers and Undercoaters: VOC not more than 200 g/L.

2. Clear Wood Finishes:

a. Varnish: VOC not more than 350 g/L.

b. Sanding Sealers: VOC not more than 350 g/L.

c. Lacquers: VOC not more than 275 g/L.

3. Stains, interior: VOC not more than 250 g/L.

4. Floor coatings: VOC not more than 100 g/L.

F. Exterior coating type: Provide exterior painting systems which are VOC compliant as per Green Seal Environmental Standard GS-11 for exterior paint VOC thresholds:

1. Non-flat: VOC not more than 200 g/L.

2. Flat: VOC not more than 100 g/L.

G. Interior/Exterior anti-corrosive and anti-rust coating types for ferrous metals: Provide interior/exterior painting systems for ferrous metals which are VOC compliant as per Green Seal Environmental Standard GC-03 for interior/exterior paint VOC thresholds:

1. Gloss: VOC not more than 250 g/L.

2. Semi-Gloss: VOC not more than 250 g/L.

3. Flat: VOC not more than 250 g/L.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.

2. Product description (generic classification or binder type).

3. Federal Specification number, if applicable.

4. Manufacturer's stock number and date of manufacture.

5. Contents by volume, for pigment and vehicle constituents.

6. Thinning instructions.

7. Application instructions.

8. Color name and number.

9. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. From freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

1.07 JOB CONDITIONS

A. Section 01 60 00 – Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.

C. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

D. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

E. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

F. Provide lighting level of 80 foot candle measured mid-height at substrate surface.

1.08 EXTRA MATERIAL

A. Provide one gallon of each different paint system, and color with manufacturers name and color clearly labeled on the top of each container.

1.09 PRE-PAINTING CONFERENCE

A. Prior to finish painting, exterior and interior, General Contractor shall schedule a "Pre-Painting Conference" to be attended by the Architect, Contractor, Painting Subcontractor and Manufacturer's Representative (Manufacturer's Rep. to attend when required for special finishes.)

B. Agenda to include submittal of color and finishes sample (RE: Article 1.04 "Submittals" and review of color schedule.

C. Contractor to record discussions of conference including agreements and/or disagreements and distribute a copy of record to each party in attendance.

PART 2 - PRODUCTS

2.01 SUBSTITUTION

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect’s review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MANUFACTURERS

A. Coating Manufacturer:

1. Sherwin-Williams (S-W).

a. Refer to "List of Finishes" located on the drawings for paint colors. Coating manufacturer shall computer match the colors selected.

B. Substitutions are permitted. Coating systems submitted from Benjamin Moore and Co. or Pratt and Lambert shall match the systems including VOC limits and ASTM numbers specified at the end of this section.

C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Refer to Section 01 31 00 – Project Management & Coordination

C. Refer to Section 01 73 00 - Execution

3.02 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knob sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

c. When transparent finish is required, backprime with spar varnish.

d. Seal tops, bottoms, and cutouts of wood doors with a heavy coat of varnish or sealer immediately upon delivery.

3. Ferrous Metals: Clean non-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Allow to weather a minimum of 6 months prior to coating. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner, then prime as required. When weathering is not possible or the surface has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 as necessary to remove these treatments.

5. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by solvent cleaning per SSPC-SP1, solvent cleaning.

6. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer’s written instructions.

c. Cementitious materials shall have cured for a minimum of 30 days prior to painting.

d. Damaged areas shall be repaired using appropriate materials.

7. Drywall: Surface must be clean and dry. All nail or screw heads must be set and spackled. Joints must be taped and covered with joint compound. Spackled fastener heads and tape joints must be sanded smooth and all dust removed prior to painting.

8. Previously coated surfaces: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, rust, mold, mildew, mortar efflorescence and scalers. Glossy surfaces of old paint films shall be clean and dull before painting. Clean and dull surface either by washing with an abrasive cleaner, or by washing and sanding. Spot prime bare areas with appropriate primer. Check for compatibility by applying a test patch of the specified system, coating an area of 3 square feet. Allow to dry for one week before testing adhesion as per ASTM D3359. If coating is incompatible, prepare surface in conformance with ASTM D4259.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

3.03 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Non-zinc coated architectural metals, steel doors and steel frames shall have all coatings spray applied. Brush application is not acceptable.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in "schedules."

2. Provide finish coats that are compatible with primers used.

3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has

cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

9. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

10. Sand lightly between each succeeding enamel or varnish coat.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

F. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where

evidence of suction spots or unsealed areas in first coat appears to assure a finish coat with no burn through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

K. Stripple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated:

B. Metals:

1. Ferrous Metal (Anti-Corrosive coating):

a. Sherwin Williams Acrolon 218 HS Polyurethane: 1 finish coat over primer on properly prepared surface:

b. Primer:

1) Sherwin-Williams Macropoxy 646 – One coat over prepared-cleaned surfaces

3. Stucco Surfaces and EIFS Substrates:

a. Primer:

1) Sherwin-Williams Loxon Concrete and Masonry Primer A24W8300 VOC: 97 g/L.

b. First and Second Coats:

1) Sherwin-Williams ConFlex XL High Build Elastomeric A05-450 Series (13.0 - 16.0 mils wet, 6.0 - 7.5 mils dry per coat)

4. Bollards

a. Primer:

1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer B66W300 VOC: 97 g/L.

b. First and Second Coats:

1) Sherwin-Williams Pro Industrial Urethane Alkyd (Safety Yellow) B54-150 Series

5. Parking Striping/Curb Ramps

a. One Coat:

1) Sherwin-Williams Set Fast Acrylic Traffic Marking Paint (Yellow)

3.07 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates as indicated.

B. Drywall (walls and ceiling): Furnish sample on 2'x2' piece of drywall for architect to approve prior to application.

1. Gypsum Drywall Systems:

a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Texture

1) USG Sheetrock Brand Wall and Ceiling Spray Texture (Multipurpose) (fine orange peel).

2) Texture Additive: Sheetrock Brand First Coat: Add at a rate of 1 gal. per bag of texture-substitute for 1 gal. of water.
VOC: 2 g/L.

c. Primer:

1) Sherwin-Williams Pro Mar 200 Zero VOC Primer B28W2600 (4 mils wet; 1.3 mils dry)
VOC: 43 g/L < 50 g/L

a. First and Second Coats:

1) Sherwin-Williams Pro Mar 200 Zero VOC Acrylic Semi-Gloss (B31W2600) (4 mils wet, 1.4 mils dry per coat).
VOC: 0 g/L < 50 g/L.

2. Gypsum Drywall Systems:

a. Egg-Shell Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Texture

1) USG Sheetrock Brand Wall and Ceiling Spray Texture (Multipurpose) (fine orange peel).

2) Texture Additive: Sheetrock Brand First Coat: Add at a rate of 1 gal. per bag of texture-substitute for 1 gal. of water.
VOC: 2 g/L.

c. Primer:

1) Sherwin-Williams Pro Mar 200 Zero VOC Primer B28W2600 (4 mils wet; 1.3 mils dry)
VOC: 43 g/L < 50 g/L

d. First and Second Coats:

1) Sherwin-Williams Pro Mar 200 Zero VOC Interior Latex Eg-Shel B20W2600 (4 mils wet, 1.7 mils dry per coat).
VOC: 41 g/L < 50 g/L.

C. Metals

1. Ferrous Metals:

a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Primer:

1) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66-310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry).
VOC: Unreduced 89 g/L < 250 g/L.

c. First and Second Coats:

1) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B31 Series) (4 mils wet, 1.4 mils dry per coat).
VOC: 0 g/L < 50 g/L.

2. Zinc Coated Metals:

a. Semi-Gloss Acrylic Enamel: 2 coats on properly prepared surface:

b. Primer

1) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66-310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry).
VOC: Unreduced 89 g/L < 250 g/L.

c. First and Second Coats:

1) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B66 W611) (4 mils wet, 1.4 mils dry per coat).
VOC: 0 g/L < 50 g/L.

3. Ferrous Metal Handrails and Guardrails:

a. Handrails:

1) Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface.

2) Primer:

a) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66–310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry). VOC: Unreduced 110 g/L < 200 g/L.

3) First and Second Coats:

a) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B66W611) (4 mils wet, 1.4 mils dry per coat). VOC: 0 g/L < 50 g/L.

D. Wood (Trim) Painted

1. Semi-Gloss Acrylic Enamel: 2 coats over primer on properly prepared surface: Verify all fasteners are set below the surface of the wood. Apply wood filler, compatible with paint, to all exposed indentations. Sand smooth.

2. Primer:

a. Sherwin-Williams Premium Wood and Wall Primer (B28W08111) (3 mils wet, 1.3 mils dry)

b. Sand prime coats with 220 grit sand paper.
VOC: 36 g/L < 200 g/L.

3. First and Second Coats:

a. Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss (B31 Series) (4.0 mils wet, 1.4 mils dry per coat).
VOC: 144 g/L < 150 g/L.

E. Wood (Trim) Clear wood finish:

1. Polyurethane, Satin: 2 coats. Verify all fasteners are set below the surface of the wood. Apply wood filler to all exposed indentations. Sand smooth.

2. First and Second Coats:

a. Sherwin-Williams Wood Classics Waterborne Polyurethane Varnish (A68 Series) (3.2 -4 mils wet; 0.8-1.0 mils dry per coat)
VOC: Satin 309 g/L < 350 g/L.

F. Wood (Stained) with clear polyurethane varnish

1. Stain: One coat of MINWAX Low VOC Wood Finish. Stain color as selected by Architect. VOC: 250 g/L = 250 g/L.

2. First and Second Coats:

a. MinWax 250 Waterbased Varnish (3.2 -4 mils wet; 0.8-1.0 mils dry per coat) VOC: Satin 309 g/L < 350 g/L.

G. Exposed Concrete Floors and Curbs in HVAC rooms:

1. Waterbased Urethane Finish: 2 coats over primer on properly prepared surface with anti-slip additive. Prepare concrete surfaces in accordance with SSPC-SP13/NACE 6.

2. Primer:
a. Sherwin-Williams ArmorSeal Water Based Epoxy Primer (B70AQ11, B60VQ11) (6.0-8.0 mils wet; 5.0-7.0 dry).
VOC: <20 g/L < 200 g/L.

3. First and Second Coats:

a. Sherwin-Williams ArmorSeal Armor-Plex Water Based Urethane (B65-750, B65V750), (3.5-5.0 mils wet, 2.0-3.0 mils dry per coat).

b. Anti-slip additive: H&C SharkGrip added to the coating.
VOC: Unreduced < 50 g/L < 150 g/L.

H. Masonry

1. Concrete Masonry Units:

a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Primer:

1) Sherwin-Williams PrepRite Block Filler (B25W25) (16 mils wet, 8 mils dry) VOC: 45 g/L.

c. First and Second Coats:

1) Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss (B31 Series) (4 mils wet, 1.4 mils dry per coat).
VOC: 144 g/L < 150 g/L.

3.08 CONSTRUCTION WASTE

A. Comply with Section 01 74 19-Construction Waste for management for reuse, salvage or recycle non-hazardous waste material.

3.09 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 10 14 00
SIGNAGE

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Signage Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Building Identification Signage.

2. Entrances Door Signage.

3. Interior-Room Identification Signage.

4. Barrier Free Signs.

5. Vinyl Reception Window Letters.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Cast-In-Place Concrete Work - Section 03 30 00.

2. Unit Structural Masonry - Section 04 23 00.

3. Finish Carpentry - Section 06 20 00.

4. Aluminum Framed Entrance and Storefronts - Section 08 41 13.

5. Paints and Coatings - Section 09 90 00.

6. Toilet Compartments - Section 10 21 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish all signs in accordance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect's review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer's printed specifications and/or instructions, the Architect's Drawings and Specifications, and as directed by the Architect.

B. Single Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

C. Design Criteria: The Drawings indicate size, profiles, dimensional requirements and graphics layout of signs and are based on the specific type and/or model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.04 SUBMITTALS

A. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

B. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

C. Shop Drawings: Prepare and submit fully detailed drawings of all items specified herein.

D. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

E. Samples: Submit 4" x 4" color Samples on materials to be used for fabrication. Written approval shall be secured from the Architect. Installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 BUILDING IDENTIFICATION SIGNAGE

A. Manufacturer: Signage specified herein shall be as manufactured by Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent product subject to review by the Architect.

B. General: Provide complete and coordinated signage with maximum flexibility and use of manufacturer's standards. Design effect shall maintain overall continuity of color, letter style, and shape as specified herein.

C. Graphic System: Allenite-Architectural Sign Systems, "System 1700 - Vinyl Lettered Signs & Vinyl Letters", computer-cut, pressure sensitive and pre-spaced strips. System shall be forward or reverse cut as selected by the Architect.

1. Sign Address Numbers or Letters: 4" high (unless otherwise directed by local authorities), "Helvetica Medium" Style; as noted on drawings.

2. Colors: As selected by Owner and to comply with the Texas Accessibility Standards.

3. Mounting: Pressure sensitive material with manufacturer's adhesive.

4. Address Numbers: Suitable for mounting above building's aluminum front entrance doors.

D. Exterior Signs Required: Sign titles and quantities include, but are not necessarily limited to the following.

1. Building Fronts: Addresses as required by the Fire Marshall.

2. As noted on the drawings.

2.03 ALUMINUM/GLASS ENTRANCE DOOR SIGNAGE

A. Manufacturer: Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent products subject to review by the Architect.

B. Graphic System: Allenite-Architectural Sign Systems, “System 1700 - Vinyl Lettered Signs & Vinyl Letters”, computer-cut, pressure sensitive and pre-spaced strips.

C. Door Signage:

1. International Symbol of Accessibility Signs: 3" square, contrasting blue background and white graphics, with matte non-glare finish.

2. Egress Signage: Each storefront door sign shall have “Helvetica Medium Style” white letters not less than 1 inch high on a contrasting black background.
   a. Wording: Sign shall read “THIS DOOR MUST REMAIN UNLOCKED DURING NORMAL BUSINESS HOURS”.

2.04 INTERIOR-ROOM IDENTIFICATION SIGNAGE

A. Manufacturer: Signage specified herein shall be signs as manufactured by Innerface Architectural Signage, Inc., 5320 Webb Parkway, Lilburn, GA 30247, (770)921-5566, **www.interface-signage.com.**

B. Comparable Products: Manufacturers with comparable equivalent signage may be acceptable, subject to conformance with these Specifications and review by the Architect and/or Owner.

C. Sign Type: Engraved Plate Signage. Signs shall be Plaque Modules, suitable for wall mounting or hung from the ceiling. Verify mounting condition and location with Tenant.

1. Construction: Signs shall have raised graphic symbols and letters and ADA compliant Grade 2 Braille as an integral part of the material. Signs shall be contrasting two-color, scratch resistant, non-static, fire-retardant, washable material with a non-glare matte finish surface, unframed, with finished edges and round corners.

2. Colors: Royal Blue background with White lettering. Color to be verified with Tenant.

3. Sizing: For “bidding purposes”, verify final size with Tenant.

4. Room Signs: 7" x 7", module 4.0 with insert.

5. Mounting: Factory prepared with 1/16" thick vinyl foam tape or mounting holes for use with mechanical fasteners, subject to review by the Architect and/or Owner. General area signs may be hung from ceiling as determined by Tenant.

D. Room Signs Required: Sign titles and quantities include, but are not necessarily limited to the following. Verify final number of signs and titles with the Tenant.

1. Women (3 required)
2. Men (3 required)
3. Restroom (3 required)
4. Stairs (4 required)
5. Mechanical (3 required)
6. Janitor (1 required)
7. Classroom (1 required)
8. Storage (4 required)
9. Timing Room (1 required)
10. Conditioning (1 required)
11. Concession (1 required)
12. First Aid (1 required)
13. Trainer (1 required)
14. Elevator (1 required)
15. Elevator Equipment (1 required)
16. IT (1 required)
17. Conference Room (2 required)
18. Office (10 required)
19. Lifeguard/Break Room (1 required)
20. Administration (2 required)

21. Reception (2 required)

22. Pool Equipment Yard (3 required)

23. Calcium Hypo. System (1 required)

24. Acid Room (1 required)

25. Electrical Room (2 required)

26. Riser Room (1 required)

E. Lettering Style: Raised 1/32 inch upper case Helvetica medium

F. Accessibility Requirements: Facilities and elements required to be identified as accessible shall include the International Symbol of Accessibility pictogram with verbal description, and Grade 2 Braille. Signage shall comply with applicable provisions of Title III of ADA, Article 4.30 within Appendix A to Part 36 of 28 CFR. Field area size shall be in accordance with governing code requirements for accessibility and use by persons with disabilities.

2.05 BARRIER FREE SIGNS

A. Manufacturer: Signage specified herein shall be as manufactured by Seton Identification Products, 20 Thompson Road, P.O. Box 819, Branford, CT 06405-0819, (800)571-2596 or (203)488-8059; www.seton.com.

B. Comparable Products: Comparable equivalent signage by the following company or other comparable manufacturer's product may be acceptable, subject to conformance with these Specifications and the Architect's review.

1. Allen Markings, 1130 Elmwwod Avenue, Kansas City, MO 64127, (816)842-0963 or (800)825-0150; www.allendiv.com.

C. Decal Signs: Barrier free signs at toilet partitions designated for individuals with a disability shall be Seton "Handicap Symbol Decal", Item #35839, tear-resistant, self-adhesive vinyl single sided decal.

1. Graphics: International Symbol Accessibility sign shall have contrasting blue background and white graphics, with matte non-glare finish.

2. Size: 4" x 4".

2.06 VINYL LETTERED SIGNAGE

A. Manufacturer: Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent products subject to review by the Architect.
- Refer Interior Elevations and Construction Documents for additional vinyl signage to be applied at the front door for Hours of Operation, etc.

B. Graphic System: Allenite-Architectural Sign Systems, “System 1700 - Vinyl Lettered Signs & Vinyl Letters”, computer-cut, pressure sensitive adhesive and pre-spaced strips.

C. Front Doors:

1. Letters: 2" high, for Hours of Operation. Refer drawings. Coordinate color and locations with the tenant.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 – Execution

3.02 INSTALLATION

A. General: Furnish and install products as shown on the Drawings and specified herein. Special attention shall be given to, but not necessarily limited to the following:

1. Exterior Building Identification Signage: Install signs as indicated and/or shown on the Drawings.

2. Aluminum/Glass Entrance Door Signage: All accessible public entrance doors shall be provided with “International Symbol of Accessibility Signs” and “Egress Signage” as specified herein.

a. International Symbol of Accessibility Signs: Graphics shall be readable from exterior side of door.

b. Egress Signage: Apply signage so that wording is readable from interior face side of storefront door.

c. Surface Conditions: Apply signage on clean surfaces, flat and smooth without ripples or air bubbles.

d. Compliance with Local Authorities: Signage shall be located as required by local authorities.

3. Interior-Room Identification Signage: Install signs as indicated and/or shown on the Drawings.

4. Barrier Free Signs: Install signs for toilet compartment/partition stall doors where indicated on the Drawings for individuals with a disability.

5. General Area Sign: Install signs in locations as directed by Tenant.

6. Vinyl Lettered Signage: Install numbers and letters in locations as directed by Tenant.

B. Accessory Materials: Provide all accessory materials required and necessary for complete and finished installations.

C. ADA Accessibility Guidelines: Signage required to be with accessible designation shall comply with “Mounting Location and Height” specified within the provisions of Article 4.30 of the ADA Accessibility Guidelines.

D. Protection: Protective covers provided by the manufacturer to protect the finishes shall not be removed until final cleaning.

3.03 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

1. Coordinate color and locations with the tenant.

END OF SECTION

SECTION 10 21 16
SOLID PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid plastic toilet compartments and urinal screens.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 SYSTEM DESCRIPTION

A. Compartment Configurations:
   1. Toilet partitions: Floor mounted, overhead braced.
   2. Urinal screens: Wall mounted.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
   2. Product Data: Manufacturer's descriptive data for panels, hardware, and accessories.
   3. Samples: 2 x 3 inch samples showing available colors.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.

B. Installer Qualifications: Minimum 5 years experience in work of this Section.

1.5 WARRANTIES

A. Provide manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Scranton Products. (www.scrantonproducts.com)

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Doors, Panels and Pilasters:
   1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
   2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
   3. 1 inch thick with edges rounded to 1/4 inch radius.

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Stainless Steel: ASTM A167, Type 304.

2.3 HARDWARE

A. Hinges:
   1. 8 inches long, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, Torx head sex bolts.
   2. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.

B. Door Strike and Keeper:
   1. 6 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to pilasters with stainless steel tamper resistant Torx head sex bolts.
   2. Bumper: Extruded black vinyl.

C. Latch and Housing:
   1. Heavy-duty extruded aluminum.
   2. Latch housing: Bright dip anodized finish.
   3. Slide bolt and button: Black anodized finish.

D. Coat Hook/Bumper:
   1. Combination type, chrome plated Zamak.
   2. Equip outswing handicapped doors with second door pull and door stop.

E. Door Pulls: Chrome plated Zamak.

2.4 COMPONENTS

A. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor, [with aluminum heat-sinc fastened to bottom edges.]

B. Pilasters: 82 inches high, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt.

C. Pilaster Sleeves: 3 inches high, one-piece molded HDPE, 20 gage stainless steel, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

D. Wall Brackets: 54 inches long, heavy-duty aluminum, fastened to pilasters and panels with stainless steel tamper resistant Torx head sex bolts.

E. Head rail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish, fastened to head rail bracket with stainless steel tamper resistant Torx head sex bolt and at top of pilaster with stainless steel tamper resistant Torx head screws.

F. Head rail Brackets: 20 gage stainless steel, satin finish, secured to wall with stainless steel tamper resistant Torx head screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install compartments in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install rigid, straight, plumb, and level.

C. Locate bottom edge of doors and panels 14 inches above finished floor.

D. Provide uniform, maximum 3/8 inch vertical clearance at doors.

E. Not Acceptable: Evidence of cutting, drilling, or patching.

F. Toilet compartment doors, including door hardware, shall comply with TAS 404. The door shall be self-closing.

G. The accessible toilet compartment doors are to have pulls on both sides. Comply with TAS 404.2.7.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide Toilet Accessories Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Grab Bars
2. Toilet Paper Dispensers
3. Framed Mirrors
4. Sanitary Napkin/Tampon Dispensers
5. Sanitary Napkin Disposals
6. Soap Dispensers
7. Insulation Kits for Lavatories with Exposed Piping
10. Mop Hangers/Hook
11. Coat Hook with Bumper
13. Diaper Changing Station
14. Electric Hand Dryer
15. Heavy Duty Shower Curtain Rod with Concealed Mounting
16. Hangers
17. Curtains
18. Paper Tower Dispensers

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Rough Carpentry - Section 06 10 00

2. Finish Carpentry - Section 06 20 00

3. Gypsum Wallboard - Section 09 29 00

4. Thin-Set Tile Work - Section 09 31 00

5. Solid Plastic Toilet Compartments - Section 10 21 16

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish toilet accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336 and the Texas Accessibility Standards.

1.03 QUALITY ASSURANCE

A. Heavy Duty Construction: Provide where applicable, product and material accommodations with reinforcements suitable for obesity clinic patients weighing 400 pounds.

1.04 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

C. Samples: Submit 4" x 4" Samples of colors and/or finishes specified herein, for approval PRIOR to installation. Written approval shall be secured from the Architect, and installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Lead Time: When phenolic and plastic laminated products are specified, allow not less than six (6) weeks lead time.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

B. Stainless Steel Framed Mirrors: In addition to the above warranty, the stainless steel framed mirror manufacturer shall provide industry standard of not less than a fifteen (15) year written guarantee against glass mirror silver spoilage.

PART 2 - PRODUCTS

2.01 TOILET ROOM ACCESSORIES - GENERAL

A. Manufacturer: Unless otherwise noted, items specified herein represent commercial quality products manufactured by the following manufacturer, and illustrate the type, function, size, operation, material, finish and constructions required.

1. Bobrick Washroom Equipment, Inc., 11611 Hart Street, North Hollywood, CA 91605-5882, (800)553-1600, (818)982-9600 or (818)764-1000; ww.bobrick.com.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

C. Material and Finish: Unless otherwise specified, all items shall be of Type 304 stainless steel with satin finish.

D. Supplementary Hardware: Furnish each item complete with non-corrosive fasteners, anchorage, trim, and back-up plates as required for securing to walls (masonry and/or drywall). Furnish all incidental parts.

E. Fasteners: Provide vandal-resistant fasteners wherever exposed fasteners are required.

F. Locks: Toilet room accessories equipped with tumbler locks shall be keyed alike with all other locked toilet room accessories, with the exception of coin boxes in vending equipment. All tumbler locks shall be fastened to accessories with lock nuts. Fastening locks to units with spring clips is not acceptable.

G. Product Identification Labels: Products shall have either a printed waterproof label or stamped nameplate indicating manufacturer's name and product model number. Identification labels shall not be on the exposed finish surface of the product.

2.02 TOILET ROOM ACCESSORIES

A. Grab Bars: BOBRICK 5806 (Refer to dwgs for length required) 1-1/2" diameter, knurled finish, concealed mounting.

B. Toilet Paper Dispensers: Bobrick model B2840

C. Wall mounted Framed Mirrors: Bobrick B-165 series, stainless steel, framed. (Refer to dwgs for required sizes).

D. Sanitary Napkin/Tampon Dispensers: Refer drawings for mounting heights. Owner Provided.

E. Surface-mounted Sanitary Napkin Disposals: Bobrick Contura Series B-270
Soap Dispensers: Surface Mounted Foam Soap Dispenser Contura Series: Bobrick Model B-4112. Refer drawings for mounting heights.

G. Paper Towel Dispenser and Waste Receptacle Units. Refer drawings for mounting heights.

1. Recessed (Paper Towel and Waste) Contura Series: Bobrick model B-43944.
2. Countertop-Mounted Circular Waste Chute B-529

H. Waste Receptacle Units. Refer drawings for mounting heights.

I. Surface-Mounted Dryer: Refer Electric Hand Dryers Spec Section 10 81 10.

K. Horizontal Wall Mounting Baby Changing Station.: Koala Kare Products Model KB200-05
(Note: Objects with leading edges more than 27 inches and not more than 80 inches above the finish floor or ground shall protrude 4 inches maximum horizontally into the circulation path.)

L. Insulation Kits: Lavatories with exposed piping shall be provided with Protective Undersink Piping Covers, specified herein, complete with all accessories required and as required by TAS. Comparable equivalent manufacturer's product, subject to review by the Architect.

1. Manufacturer: IPS® Corporation, 500 Distribution Parkway, Collierville, TN 38017, (800)888-8312 or (901)853-5001; www.truebro.com.

2. Undersink Protective Pipe Covers: ADA-compliant (Article 4.19.4), wheelchair accessible lavatory P-trap and angle valve assemblies shall be covered with molded vinyl, antimicrobial. TRUEBRO® - LAV GUARD® 2 E-Z Series waste and supply piping undersink pipe covers. Cover shall have internal trim feature for square and clean trimming, internal rib fasteners, and built-in, concealed fasteners (cable-tie fasteners shall not be permitted).

   a. Material: Soft, resilient molded vinyl.

   b. Nominal Wall: 1/8" constant with internal ribs.

   c. Trimming (E-Z Series): Internal E-Z Tear-To-Fit trim feature for installation without tools.

   d. Fasteners (E-Z Series): Internal E-Z Grip fasteners, reusable.

   e. Paintability: Material shall be paintable with latex paint where required by Drawings and/or field conditions to match adjacent material colors.

   f. Burning Characteristics: Self extinguished 0 sec (ATB) mm (AEB), in accordance with ASTM D635 - Standard Test Methodd for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

   g. Bacteria/Fungus Resistance: In accordance with ASTM G21 - Standard Practice for Determing Resistance of Synthethic Polymeric Materials to Fungi. Result: 0 growth.

   h. Color: Manufacturer’s standard “China White”, subject to approval by the Tenant, Architect and/or Owner.

3. Compatibility: Contractor shall coordinate with Plumbing Contractor for compatible complete design kit series required to fit piping assemblies.

M. Mop Hangers/Hook: Bobrick Stainless steel, 48 inches long with 4 holder. Mop-Broom Holder Model No. B-223.

N. Paper Tower Dispensers (for break room area and kitchen): Bobrick Classic Series Surface Mounted Paper Towel Dispenser, Model No. B-262

P. Coat Hook with Bumper: Bobrick Model No. B-212

Q. Towel Pin: Bright-polished stainless steel Towel Pin Bobrick B-677.

R. Quarter Dome Acrylic Mirrors- Bobrick.

S. Vinyl Shower Curtains with hooks- Bobrick Model No. 204-2.

T. Bobrick Heavy Duty Shower Curtain Rod with Concealed Mounted Model No. B207

2.03 CUSTODIAL ACCESSORIES

A. Mop Hangers: Mop service basin optional equipment shall be Model No. 889-CC Mop Bracket, 24" long x 3" wide, 16 gauge, type 302 stainless steel with three (3) rubber tool grips, provided with stainless steel machine and/or wood screws as required by field conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSPECTION

A. Check wall openings for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of backing within wall.

B. Verify spacing of plumbing fixtures and toilet compartments that affect installation of toilet room accessories.

3.03 INSTALLATION

A. General:

1. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.

2. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.

B. Locations and Methods of Installation: Install accessories at locations and heights indicated on the Drawings, straight, plumb and level and in accordance with manufacturer’s installation instructions. Install items with non-corrosive anchoring

devices. Installation methods shall conform to manufacturer's recommendations for backing and proper support. Conceal evidence of drilling, cutting, and fitting to room finish. Fit flanges of accessories snugly to wall surfaces.

C. Grab Bars: Mount grab bars to walls and partitions with supplied flanges and fasteners. Installed grab bars shall be anchored so as to withstand a force of not less than 300 pounds for five (5) minutes in any direction.

D. Lavatory Insulation Kits: Install on exposed piping at each lavatory.

3.04 FIELD INSPECTION

A. Toilet Room Accessories: Engage the services of the approved manufacturer's inspection service, to inspect the installation of all Toilet Room accessories specified herein, and report any installation adjustments required to place all accessories in perfect working order, at no cost to the Owner.

3.05 MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with all manufacturer's printed data, including service and parts manual, necessary for proper cleaning and maintenance of the products specified herein.

3.06 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Fire Protection Specialties Work, as indicated on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Portable Fire Extinguishers and Accessories.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish miscellaneous accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the architect’s Drawings and Specifications, and as directed by the Architect.

B. UL-Listed Products: Fire extinguishers shall meet Underwriters Laboratories Inc., UL 299 UL Standard for Safety Dry Chemical Fire Extinguishers.

1.04 SUBMITTALS

A. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

B. General: Submit Shop Drawings, Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

C. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

D. Samples: Submit 4" x 4" Samples of fire extinguisher cabinets colors and/or finishes specified herein, for approval PRIOR to installation. Written approval shall be secured from the Architect, and installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

B. Fire Extinguishers: In addition to the above warranty, the fire extinguisher manufacturer shall provide industry standard of not less than a six (6) year written warranty covering materials and workmanship, at no charge to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: Fire Extinguishers and Accessories and Fire Extinguisher Semi-Recessed Cabinets specified herein shall be as manufactured by Larsen's® Manufacturing Company, 7421 Commerce Lane N.E., Minneapolis, MN 55432, (763)571-1181 or (800)527-7367; www.larsensmfg.com.

2.02 PORTABLE FIRE EXTINGUISHERS

A. Fire Extinguishers: Larsen's®, MP Series Multi-Purpose Dry Chemical Model Number MP10 extinguishers.

1. Type: Extinguishers as specified herein shall be portable, hand-carried type, 10 pound nominal capacity 4A-60BLC, with self-closing hand valve, discharge hose, pressure gauge, in manufacturer's standard container with corrosion and impact resistant polyester/epoxy "red" paint finish. UL Rating 4A-60B:C for Class A, B and C fires. Units shall contain Halotran I.

2. Miscellaneous Requirements: Furnish test, refill schedules, procedures, and recertification requirements in accordance with National Fire Protection Association, NFPA 10 - Standard for Portable Fire Extinguishers, latest edition.

B. Fire Marshal's Approval: Size, type, and quantities of fire extinguishers as indicated on the Drawings and/or specified herein shall be subject to review and approval by the Fire Marshal.

C. Accessories:

1. Mounting Brackets: Provide manufacturer's recommended and compatible standard mounting extinguisher brackets and anchors. Brackets shall be of size and design to accommodate the accepted manufacturer's fire extinguishers.

2. Signage: Provide signs identifying the locations of fire extinguishers as required by local authorities.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSTALLATION

A. General: Provide products specified herein for installations, as indicated on the Drawings or required.

1. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

2. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.

3. Fire Extinguisher Semi-Recessed Cabinets with solid door and stainless steel trim and mounting brackets for wall hung fire extinguishers shall be securely fastened to structure, square and plumb, and in compliance with manufacturer's instructions. Submit submittal for Architects review and approval.

4. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.

B. Fire Extinguishers: Provide portable fire extinguishers for wall mounted installations on mounting brackets, in quantities as required by the Fire Marshal.

1. General: Install fire extinguishers and identifying signs in accordance with local authorities, ADA guidelines, and manufacturer's recommendations, at locations designated by the Fire Marshal.

2. Inspection: Verify servicing, charging and tagging of all fire extinguishers.

3.03 MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with all manufacturers' printed data, including service and parts manual, necessary for proper maintenance of the products specified herein.

3.04 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 10 51 26
SOLID PLASTIC LOCKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid plastic lockers.
   2. Locker benches.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements..

1.2 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
   2. Product Data: Manufacturer's descriptive data.
   3. Samples: 3 x 3 inch samples showing available colors.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience in manufacture of solid plastic lockers with products in satisfactory use under similar service conditions.

B. Installer Qualifications: Minimum 5 years experience in work of this Section.

1.4 WARRANTIES

A. Provide manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Scranton Products. (www.scrantonproducts.com)

B. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

A. Solid Plastic Panels:
   1. Lockers:
      a. High impact, high density polyethylene (HDPE) formed under high pressure into solid plastic components with homogeneous color throughout, with smooth orange peel finish.
      b. Edges machined to accept assembly brackets.

2. Locker benches:
   a. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
   b. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
3. Color: To be selected from manufacturer's full color range.

2.3 COMPONENTS - LOCKERS

A. Locker Doors and Frames: 1/2 inch thick.

B. Sides, Tops, Bottoms, Backs, and Shelves: 3/8 inch thick.

C. Latch: Continuous type, manufactured from HDPE, capable of accepting various locking mechanisms, fastened to entire length of door.

D. Door Hinge: Heavy duty extruded aluminum, full length, assembled onto door and locker front.

E. Assembly Profile: Full height of lockers, PVC plastic, snap fit assembled onto locker sides.

F. Coat Hooks: Two-prong, high impact plastic, mounted to bottom of shelf or divider, one per door opening.

2.4 COMPONENTS - LOCKER BENCHES

A. Bench Tops: 1-1/2 inch thick with edges rounded to 1/4 inch radius, 9-1/2 inches wide x length(s) indicated in drawings.

B. Pedestals: Steel, 16-1/4 inches high, secured to tops with stainless steel tamper resistant Torx head screws and to floor with lead expansion shields and 2 inch long stainless steel machine bolts.

2.5 FABRICATION

A. Fabricate locker components square and rigid, finish free from scratches and chips.

B. Fabricate locker components for snap-together assembly or slide-together dovetail connections providing solid and secure, anti-racking construction.

C. Fabricate adjacent lockers with common side panel.

D. Fabricate locker units for assembly in maximum of three adjacent lockers.

E. Fabricate locker benches to sizes indicated in single lengths.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lockers in accordance with manufacturer's instructions and approved Shop Drawings.

B. Set lockers directly on floor.

C. Set plumb, level, rigid, and aligned.

D. Attach lockers to supporting construction with anchors best suited to substrate conditions.

E. Attach locker benches to floor.

3.2 ADJUSTING

A. Adjust doors and latches to operate correctly.

END OF SECTION

SECTION 10 75 00
FLAG POLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes ground-mounted flagpoles made from steel.

B. Owner-Furnished Material: Flags.

C. Related Sections:

1. Section 076200 "Sheet Metal Flashing and Trim" for counterflashing flashing at roof-mounted flagpoles.
2. Section 264113 "Lightning Protection for Structures" for connecting wall- and roof-mounted metal flagpoles to lightning protection system.
3. Section 265600 "Exterior Lighting" for site lighting fixtures.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

1. Seismic Loads: according to SEI/ASCE 7.
2. Wind Loads: according to SEI/ASCE 7.
3. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For flagpoles. Include plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.

1. Include section, and details of foundation system for ground-mounted flagpoles.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain flagpole as complete unit, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Flagpole; a Kearney-National Inc. company.
2. Atlantic Fiberglass Products, Inc.
3. Baartol Company.
4. Concord Industries, Inc.
5. Eder Flag Manufacturing Company, Inc.
6. Ewing Flagpoles.
7. Lingo Inc.; Acme Flagpole Company Division.
8. Millerbernd Manufacturing Company.
9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
10. PLP Composite Technologies, Inc.

11. Pole-Tech Company Inc.
12. U.S. Flag & Flagpole Supply, LP.
13. USS Manufacturing Inc.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height:45 feet.

C. Steel Flagpoles: Provide cone-tapered flagpoles fabricated from standard-weight, seamless steel pipe complying with ASTM A 53/A 53M, Type S, Grade B or steel tube complying with ASTM A 513.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.
2. Provide steel ground protectors extending 12 inches above ground and 6 inches belowground for steel flagpoles where flashing collars are not provided.

E. Sleeve for Aluminum Flagpole: PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Provide flashing collar of same material and finish as flagpole.

F. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

1. Provide units made from steel with same finish and color as flagpoles.
2. Provide ground spike at grade-mounted flagpoles.
3. Provide connector to building's lightning protection system conductor at roof-mounted flagpoles.

G. Hinged Baseplate: Cast-metal tilting hinged base and anchored plate joined by permanently secured pivot rod. Provide with stainless-steel screws for securing tilting base to anchored plate when not tilted; provide with anchor bolts.

1. Finish base to match flagpole.
2. Provide aluminum base or aluminum flashing collar finished to match flagpole.
3. Provide ground spike at grade-mounted flagpoles.
4. Provide connector to building's lightning protection system conductor at roof-mounted metal flagpoles.

H. Pivoting Tilt Base: Steel baseplate with channel or rectangular tube uprights, pivot bolt, and locking device for tilting flagpole. Provide tilting flagpole with steel counterweight box and weights, or provide with internal counterweight. Provide base with anchor bolts.

1. Finish base to match flagpole.
2. Provide ground spike at grade-mounted flagpoles.
3. Provide connector to building's lightning protection system conductor at roof-mounted metal flagpoles.

4. Provide units with same finish as flagpole.

I. Braced Roof Mount: Roof-mounted flagpole socket and either rod or tubular braces with turnbuckles and mounting bases. Provide as a complete assembly with anchor bolts and connector for lightning protection system.

1. Provide braces, turnbuckles, and connectors[made from same metal and] with same finish as flagpoles.

2.3 FITTINGS

A. Finial Ball Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum, finished to match flagpole
2. 20-oz. copper with 23-karat gold leaf finish.
3. Spun stainless steel, finished to match flagpole.
4. Spun copper alloy, finished to match flagpole.

B. Internal Halyard, Winch System Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

a. Provide with neoprene or vinyl covers.

2. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Provide two flag clips per halyard.

a. Product: Subject to compliance with requirements, provide "Quiet Halyard" flag clasp by Lingo.

C. Internal Halyard, Cam Cleat System 5/16-inch- diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

a. Provide with neoprene or vinyl covers.

2. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Provide two flag clips per halyard.

    a. Product: Subject to compliance with requirements, provide "Quiet Halyard" flag clasp by Lingo.

3. Provide cast-metal cleat covers, finished to match flagpole, secured with cylinder locks.
4. Provide halyard covers consisting of a 2-inch channel, 60 inches long, finished to match flagpole.
5. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per halyard.

    a. Provide with neoprene or vinyl covers.

6. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Provide two flag clips per halyard.

    a. Product: Subject to compliance with requirements, provide "Quiet Halyard" flag clasp by Lingo.

2.4 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33, fine aggregate.

D. Elastomeric Joint Sealant: Multicomponent nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, for Use O.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

A. Flagpole Interior Finish: Apply one coat of bituminous paint on interior of flagpole or otherwise treat to prevent corrosion.

B. Galvanized Finish: Hot-dip galvanize after fabrication to comply with ASTM A 123/A 123M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including foundation; accurate placement, pattern, orientation of anchor bolts, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.3 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure. Install flagpole, plumb, in foundation tube.

1. Foundation Tube: Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten

retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION

SECTION 10 81 10
ELECTRIC HAND DRYERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Warm air, high speed, energy efficient self-contained electric hand dryers.

B. Warm air, self-contained electric hair dryers.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Blocking in stud partitions for mounting hand dryers.

B. Section 16100 - Wiring Methods: Electrical supply, conduit, wiring, boxes, and wiring devices for hand dryers.

1.3 REFERENCES

A. ICC/ANSI A117.1 - American National Standard for Accessible and Useable Buildings and Facilities; 1998.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Operating instructions and performance.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings showing dimensions, method of attachment, and required supports.

D. Dryer to be MADE IN USA Certified. Verify Certification #MAOAA.0027.

E. Electrical wiring diagrams for connection of hand dryers.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing electric hand dryers with 20 years minimum experience.

B. Equipment certified by Underwriters Laboratory, Inc., with UL labels.

C. Comply with ICC/ANSI A117.1.

1.6 WARRANTY

A. Provide manufacturer's standard limited warranty for period specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Excel Dryer, Inc., which is located at: 357 Chestnut St. P. O. Box 365 ; East Longmeadow, MA 01028; Tel: 413-525-4531; Email: request info (sales@exceldryer.com); Web: www.exceldryer.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 ELECTRIC HAND DRYERS

1. Hand Dryer: Bobrick B-7128 TrimLine ADA No-Touch Surface Mount Hand Dryer
2. Cover — 18-gauge, Type-304 stainless steel with #4 satin-finish vertical grain (B-7128) covers with UL 94-5VA black plastic trim and side panels. Cover equipped with uniquely designed dual air outlets. Air-inlet is equipped with vandal-resistant grille. Cover projects no more than 4" (100mm) from wall and is secured to mounting base with two vandal-resistant, recessed hex screws.
3. Mounting Base — 20-gauge (1.5mm) plated steel with four 0.236" (6mm) diameter mounting holes.
4. Motor — Universal, 1/7 hp, 8000 rpm, on resilient mounting. Sealed ball bearing at drive-shaft end and self-lubricating sleeve bearing at nondrive end. Equipped with automatic thermal-overload switch.
5. Fans — Two balanced, double-inlet centrifugal fans are mounted on motor shaft; directs airflow over heating element at 71 cfm.
6. Heating Element — Two coiled nickel-chrome heating elements are mounted in mica frame and protected by automatic thermal-overload switches. Heating elements, heat air without hot spots — inaccessible to vandals.
7. Electronic Control — Infrared sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Remove hands from path of sensor and dryer stops. Electronic sensor has automatic shutoff approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally. Specify model number followed by voltage required. Example: B-7128 115V for 115-volt Stainless steel cover hand dryer. Specify Voltage Required: ♦ B-7128 Dryer with Stainless Steel Cover The illustrations and descriptions herein are applicable to production as of the date of this Technical Data Sheet. The manufacturer reserves the right to, and does from time to time, make changes and improvements in designs and dimensions. © 2013 by Bobrick Washroom Equipment, Inc. OPERATION: No-touch operation: electronic sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Dual air outlets provide a swirling circulation of airflow for comfortable hand drying. Drying time less than 25 seconds. Remove hands from path of sensor and dryer stops. Dryer operates only when actually drying hands, which saves energy and operating costs. Electronic sensor will automatically shut dryer off 1-1/2 minutes after dryer turns on if an inanimate object, such as tape or chewing gum, is placed across air-outlet opening. After İnanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

8. 10-Year Limited Warranty — In addition to Bobrick's one-year guarantee, Bobrick extends a limited 10-year warranty from the date of purchase on all parts for Model B-7128 hand dryer, except motor brushes, to the original owner of the installed unit against defects in factory workmanship or material under normal use and service. Motor brushes are warranted for three years from date of purchase. This warranty is limited to the repair or exchange of defective parts at the option of Bobrick. See Installation Instruction Sheet, Form No. 712-69, for full details.
9. Mount dryers at heights indicated on Drawings.

2.3 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

2.4 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Coordinate requirements for blocking to ensure adequate means for support and installation of hand dryers.

D. Coordinate requirements for power supply, conduit, disconnect switches and wiring.

2.5 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install dryers at specified heights.

C. Install dryers securely to supporting substrate so that fixtures are level and aligned with each other. Use type and length of fastener as recommended by manufacturer for type of substrate.

2.6 PROTECTION

A. Inspect installation to verify secure and proper mounting. Test each dryer to verify operation, control functions, and performance. Correct deficiencies.

B. Protect installed driers until completion of project.

C. Replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10900
SPECIALTIES INDOOR POOL CEILING WALL PANEL ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 DESCRIPTION

A. The work includes all material, labor and coordination required for the complete installation of the specialty ceiling and wall panels with trademark Magnesiacore of the recommended quality and grade for use in an indoor pool and related areas as indicated on the drawings and elsewhere.

1. Other treatment for details such as expansion and control joints, penetrations, and finishing of the exposed surface are specified in their respective sections for painting, wall coverings, and caulking and as elsewhere detailed in respective sections.

1.3 SUBMITTALS

A. Provide manufacturers product data indicating material size, finish, type, color selections, installation details and attachments to other elements.

B. Maintenance data.

C. Samples: Submit sample size magnesiacore board clearly marked with the magnesiacore logo and where practical with assemblies in mock-up condition to demonstrate understanding of the work and compliance with specifications.

D. Samples for Verification of Finishes: Submit small samples of magnesiacore with the specified finish treatment applied in accordance with other sections. When practical, do a small area of the work on site in a complete manner for approval as the representative finishing standard to apply for the whole of the work

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in their original unopened packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials under cover and in manner to keep them dry, protected from weather, sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

C. Protect related materials and accessory materials in accordance with their requirements and labels.

D. Neatly stack magnesiacore boards to prevent sagging; stack flat, on continuous surface, and on skids as delivered from supplier when possible.

E. Handle magnesiacore to prevent damage to edges, ends or surfaces.

1.4 PROJECT CONDITIONS

A. Cold Weather Protection: In cold weather, maintain continuous, uniform, building temperatures of not less than 45degF (13degC) or more than 100degF (38degC) for a minimum period of 48hours prior to, during, and following installation.

B. Conditioning: Store materials in spaces where it is to be installed for 48 hours prior to installation. Do not install board when it is wet.

C. Ventilation: Ventilate building spaces as required to remove excess moisture.

PART 2 PRODUCTS

2.1. MANUFACTURER

A. Subject to compliance with requirements, provide products supplied by Magnesiacore Inc. visit www.magnesiacore.com for contact information and request further information as needed.

2.2 MATERIALS

A. Magnesiacore uses integral magnesia and aggregates reinforced with woven glass-fiber mesh without any facing materials applied. The surface of magnesiacore can be removed up to 1/3 of original thickness without significant weakness to the board.

B. Thickness: (9mm) ~3/8“ minimum or thicker for use on framing structures 24 inches on center.

C. Natural Face: Fine and smooth on one side, uniform texture on one side. Smooth side has higher natural bonding than the textured side due to a natural dusting of the texture side. Dusting on textured side can be essentially removed for finishing by wiping with a lightly damp cloth (not soaking wet) of diluted vinegar (1 part clear vinegar to 10 parts water). This removes lose particles and increases bonds.

D. Edges: sharp, square edge all four sides. Can be rounded or machined like a wood material to achieve bull-nosed, Tongue and Grove etc.

E. Weight: 2.66 lbs for 12mm (~1/2")

F. Compressive Strength: 3000 psi or 20 Mpa.

G. Flame Spread is Zero, Smoke Development is Zero per ASTM E84 and Rated Class A or Class 1 also Rated as Noncombustible material under ASTM E136.

H. PNEMATICALLY APPLIED NAILS STAPLES OR SCREWS FASTENERS:

1. Self-drilling Stainless Steel Screws with small head size (Trim Head Screws). Use screws with proper tip and tread for metal framing and wood versions for wood framing. Driven flush to surface of magnesiacore; 1-1/4 inch long screw is typical (ratio of 1.5:1 for length of screw relative to board thickness). Fastener layout can be equal distance to the stud spacing. (i.e. if using 24" on center framing then 24" on center screw spacing is sufficient)

2. Brad fasteners use 18 gage Stainless Steel Brad nails applied with common light weight pneumatic tools. For splicing magnesiacore to magnesiacore use a length that is less than the combined thickness of two boards. (i.e., two layers of 12mm thick (24mm) would use 20mm to 22mm long staples). Optimum hold board to board with pneumatic fasteners is with more than 50% and less than 75% penetration into the backer splice board strip.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and framing for compliance with requirements and conditions affecting work of this Section. Do not proceed with installation until piping, waterproofing, and other in-wall work has been installed and accepted by Architect/Engineer and any unsatisfactory conditions have been corrected.

3.2 GENERAL

A. Printed installation instructions applicable Comply with manufacturer to products and applications indicated, except when more stringent requirements apply.

Control Joints: Do not install magnesiacore continuously across building expansion movement and control joints or where control joints are required. Allow flexibility for movement from expansions and contraction of different building materials at location required. Recommended control joints in continuous seamless magnesiacore panels are at 20‘ (6 meter) intervals.

3.3 CEILINGS

A. Framing: Install panels to truss or framing as indicated on drawings. For metal framing 22 gage or thicker is recommended to avoid countersinking prior to screwing.

B. At junction boxes, ensure inside face of receptor is flush with exposed face of board.

C. Apply panels through gyp board fire proofing to framing with long dimension across framing and off set subsequent layer panels to reduce lengths of continuous vertical joints. Fit ends and edges with 3mm (~1/8“) gaps to be filled with flexible fillers leaving 3mm gaps also at inside corners and ceiling and floor junctions as well as creating control joints at approximately6meter or 20’ intervals for long walls or ceilings distances. Center end or edge joints in between framing and off of studs for backstop splicing with staggered joints in adjacent rows when possible.

D. Fasten to framing by locating screws on wall and ceiling framing: 12” or 30 cm apart starting at 6” or 15 cm from edges. Vertical and horizontal joints are spliced using backstops of magnesiacore strips and brad nails when needed. In two layer systems the back layer acts as the backstop for joints.

3.5 JOINT TREATMENT

A. Non-tiled, Exposed or Painted Surfaces: Clean off dust, dirt or debris prior to starting jointing. Gaps of 3mm to 6mm wide are filled with epoxy fillers trimmed and sanded for a seamless appearance.

3.6 COATING AND SURFASCE FINISHING

Follow coating manufacturer recommendations given for porous surfaces such as wood or cement surfaces. Pool Grade Epoxy Paint and other Marine Grade Paints and coatings are used for finishing

3.7 CUTTING BLADES AND TOOLS

Magnesiacore is best cut with 4” smooth diamond blades for crisp sharp square cuts and bevels or reveals like for ceramic tile but the blades are used dry without water. For rough cuts a score and snap over an edge gives quick cut. Drilling is done with masonry bits or diamond grit tip and core bits and well as for cutting with jigsaws and sawzal blades. A belt sander or flapper disc makes for smooth edges, beveled and bull nosed corners and to even out uneven board joints when joints are not flush.

SECTION 12 21 13.13
METAL HORIZONTAL LOUVER BLINDS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Metal Horizontal Louver Blind Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to, the following:

1. Horizontal Aluminum Window Coverings (Non-motorized Window Blind System).

B. Related Sections: The following items of related Work will be provided for under other sections of the Specifications, as indicated:

1. Carpentry Work - Sections 06 10 00 and 06 20 00.

2. Glass, Glazing, and Aluminum Work - Section 08 41 00.

3. Gypsum Wallboard Construction - Section 09 29 00.

4. Interior Painting and Finishing - Section 09 91 23.

1.02 QUALITY ASSURANCE

A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.

B. Installer’s Qualifications:

1. Installer shall be a firm approved by the specified manufacturer.

2. Installer shall be qualified to install the product specified, as demonstrated by proof of prior experience.

1.03 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Shop Drawings: Prepare complete detailed Shop Drawings showing all fabricated items, and the methods of installation for all Work included in this section of the Specifications.
   1. Shop Drawings shall indicate field measured dimensions of openings which are to receive blinds, details on mounting surface and sill conditions.

D. Submittals:

   1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

E. Samples: Submit the following required Samples, each legibly marked with the name of the Project, and the location of the building. Manufacturer's color charts and/or color swatches will not be accepted as Samples.
   1. Color Samples: Submit Samples of each type and color of materials specified.

1.04 QUALITY CONTROL

A. Defective Materials: Promptly replace all defective materials and workmanship to the satisfaction of the Architect, at no cost to the Owner.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Delivery:

   1. Deliver all products, materials, accessories, etc. at location designated by the General Contractor.

   2. Materials shall be delivered to the Project in manufacturer's original unopened packaging with labels intact.

B. Storage: Store all products and materials at the site above the ground. Handle all materials in a manner that will prevent damage to same. Do not place materials directly on ground. Do not dump materials in piles. Damaged materials will not be acceptable, and shall be removed from the site.

1. Materials shall be stored in a clean area which is free of corrosive fumes, dust, and away from construction activities.

2. Materials shall be stacked horizontally using plastic or wood shims such that drainage and ventilation are provided for, and such that water cannot accumulate in, about or upon the containers.

3. Stacks shall be covered with tarpaulins or plastic such that ventilation is provided for, and such that contaminants are prevented from contacting surfaces.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

1.06 INSPECTION

A. Contractor shall be responsible for inspection of site, field measurements, and approval of mounting surfaces and installation conditions.

B. Carefully inspect all surfaces upon which the Work of this section is to be installed; and notify the General Contractor, in writing, for correction, of any condition, detrimental to the installation of this Work. The installation of any materials of this section will be considered this Contractor’s acceptance of the field conditions. Therefore, if any defective Work is covered in, remove and replace the affected Work of this section, without extra cost to the Owner.

1.07 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding, ladders, etc., all in accordance with the standards of all governing local, state, and national safety codes, as required for the performance of all Work of this section of the Specifications. Such equipment shall be erected at times and locations so as not to delay any part of this or any other Work. When no longer required, promptly dismantle the equipment and remove same from the site.

1.08 PROJECT/SITE CONDITIONS

A. Windows and frames shall be installed and glazed, and interior doors hung.

B. Wet Work including gypsum board spackling, and taping (including sanding), painting, shall be complete and dry.

C. Ceilings, window pockets, Electrical Work, and Mechanical Work and above the window blind system shall be complete.

1.09 WARRANTY

A. Form of Warranty: Execute a warranty, in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the period specified, and any damage to other Work caused by such imperfections or by the repairing of same. The period for all Work shall be for not less than one (1) year from date of Owner's acceptance of the installation.

B. Manufacturer's Warranty: Provide manufacturer's Limited Lifetime Warrant to repair or replace for the life of the blind, without charge, any part found defective in workmanship or material, in accordance with the manufacturer's standard requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTION

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MANUFACTURER AND PRODUCT

A. Manufacturer: Window Blind System specified herein shall be as manufactured by Hunter Douglas Contract, 12250 Parkway Centre Dr., Poway, CA 92064, (800)727-8953, www.hunterdouglascontract.com.

1. Product: CX80 - 1" Mini Aluminum Horizontal Blind.

2. Finish and Color: 065 Brushed Aluminum.

B. Materials:

1. Headrail: .024" thick painted steel, 1" high x 1" wide with a U-shaped profile. Headrail shall be a valance-free design and shall be coated with a baked-on polyester finish. All headrail detailing shall be polyethylene. All hardware shall be enclosed in the metal headrail. Ends fitted with .024" steel end lock with adjustable tab for centering blind.

2. Disengaging Clutch Mechanism: Guardian Tilter mechanism shall be of a .042" thick Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to provide maximum closure, eliminate overdrive, and prevent strain or damage to blind.

3. Tilt Wand: Solid, clear, transparent acrylic with round cross section of 9⁄32" diameter. The tilt wand mechanism shall exit the bottom of the headrail via a U-shaped black or bright metalplated steel link. The tilt wand end shall contain a split eye machining detail that facilitates attachment and removal of the wand from the headrail.

4. Lifting Mechanism: Crashproof cordlock in polymer housing with nickel-plate die-cast bearing surface and brass locking clips, two-ply polyester cord filler in braided polyester jacket lift cords, cord equalizers, cordlock adapter and cord stop/single pull cord.

5. Tilting Mechanism: Permanently lubricated die-cast worm and gear type tilter gear mechanism in fully enclosed housing with clutch action.

6. Slats: Heat-treated and spring tempered aluminum alloy 6011, nominally 1" wide and .008" thickness. Slats shall have manufacturer's standard baked-on finish. Slat thickness and ladder support distances shall prevent visible sag or bow after continued use indoors. Furnish not less than 15.2 slats per foot.

7. Ladders (Slat Supports): Braided polyester yarn dyed to color as required to match with slats. Ladder shall support the ladders without visible distortion. Distance between slats shall not exceed 20 mm.
8. Bottomrail: Baked-on polyester finish steel and shall be fully enclosed with color compatible flexible bottom bumper and polyethylene vinyl end caps designed to prevent bottomrail from marring window sill and/or mullions.

9. Paint Finish: Provide manufacturer's Dust Shield™ permanent, patented factory/shop paint process to disrupt the natural static attraction of airborne dust particles.

10. Installation Brackets: Provide brackets, suitable for conditions as required by Drawings and/or field conditions. Brackets shall be a one-piece .040" steel box designed to minimize light gaps. A spring mechanism shall provide preload engagement with the headrail.

    a. Intermediate Brackets: Provide brackets of the same design as installation brackets for blinds over 60" wide.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSPECTION

A. Window treatment subcontractor shall be responsible for inspection of site, field measurements, and approval of mounting surfaces and installation conditions.

B. Subcontractor shall verify that site is free of conditions that interfere with blind installation and operation, and shall begin installation only when any unsatisfactory conditions have been rectified.

3.03 INSTALLATION

A. Installation shall comply with manufacturer's specifications, standards, and procedures.

B. Provide support brackets in accordance with manufacturer's installation instructions.

C. Provide adequate clearance to permit unencumbered operation of blind and hardware.

D. Demonstrate to Owner's Representative that blinds are uniform and smooth working order.

3.04 CLEANING

A. Clean soiled blinds with a mild soap solution only. Do not use cleaning methods involving heat, bleach, abrasives, or solvents. Do not use window cleaner or cloths with paper content.

B. Ensure proper drying following cleaning by providing adequate ventilation.

C. Work Required: Clean-up any Work soiled in the performance of the Work under this section.

D. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.

E. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

F. Waste Management: Collect field generated construction waste created during construction or final cleaning in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

END OF SECTION

SECTION 123661.16
SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.
5. Solid surface material sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Wood trim, 8 inches long.
3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. LG Himacs
b. Wilsonart LLC.
c. Daltile

2. Type: Provide Veneer type made from material complying with requirements for Standard type, as indicated unless Special Purpose type is indicated.
3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Particleboard: ANSI A208.1, Grade M-2.

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: Straight, slightly eased at top 3/4-inch bullnose] [Radius edge with apron, 2 inches high with 3/8-inch radius] [1-1/2-inch laminated bullnose] [1-inch laminated bullnose] [Straight, slightly eased at top with separate apron, 6 inches high, recessed 1/4-inch behind front edge] [Wood-trimmed edge as indicated].
2. Integral Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops: 1/4-inch thick, solid surface material laminated to 3/4-inch thick particleboard with exposed edges faced with 1/4-inch thick, solid surface material.

D. Backsplashes: 3/4-inch thick, solid surface material.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

F. Joints: Fabricate countertops without joints.

G. Joints: Fabricate countertops in sections for joining in field.

1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.

H. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures[in shop] using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

SECTION 12 48 13
ENTRANCE FLOOR MATS AND FRAMES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 GENERAL

1.01 SUMMARY

A. This section includes the following types of entrance flooring systems:

1. Floor Mats & Frame Assemblies

2. Floor Grids & Frame Assemblies

B. Related Sections: The following sections contain requirements related to this section:

1. Grouting frames into recess; refer to sections 03300 “Cast-In-Place Concrete” and section 03600 “Grout”

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. The Aluminum Association

C. The Carpet and Rug Institute (CRI)

D. The National Floor Safety Institute (NFSI)

1.03 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C. General: Submit the following in accordance with conditions of contract and Division 1 specification section 01300.

D. Product data for each type of floor mat/grid and frame specified including manufacturer's specifications and installation instructions.

E. Shop drawings in sufficient detail showing layout of mat/grid and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.

F. Samples for verification purposes: Submit an assembled section of floor mat/grid and frame members with selected tread insert showing each type of color for exposed floor mat/grid, frame and accessories required.

G. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats/grids.

1.04 QUALITY ASSURANCE

A. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

B. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

C. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m^2.

D. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.

E. Standard rolling load performance to be 1000 lb./wheel (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

F. Single Source Responsibility: Obtain floor mats/grids and frames from one source of a single manufacturer.

G. Utilize superior structural aluminum alloy 6105-T5 for rail components.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

B. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 PROJECT CONDITIONS

A. Field measurements: Check actual openings for mats/grids by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. For recess application coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer frame installation until building enclosure is complete and related interior finish work is in progress.

PART 2 PRODUCTS

2.01 A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MANUFACTURERS

A. Drawings and specifications are based on manufacturer's literature from Construction Specialties, Inc. unless otherwise indicated. Other manufacturers must comply with the minimum levels of material and detailing indicated on the drawings and specified herein.

2.03 MATERIALS

A. Aluminum - ASTM B 221, alloy 6105-T5, 6105-T6 for extrusions.

B. Flexible and prime EPDM extrusions.

C. Tread insert options - refer to section 2.05.

2.04 FLOOR MATS

A. Model and Description - G4 PediTred shall be extruded 6105-T5 aluminum alloy with 3/4" deep tread rails joined by an EPDM hinge and cushion to compromise the overall grid length (traffic direction). The hinge shall be complete with perforations between each tread rail for drainage, unless otherwise specified. Rail finish to be clear anodized. Unit must withstand 1000 lb. wheel loads (load applied to a 5" x 2" wide polyurethane wheel, 1000 passes without damage).

2.05 MAT FRAMES

A. LB - Level Base Frame shall be a 1" (25.4mm) deep recessed frame in 6063-T6 aluminum alloy with a 1/4"(6.4mm) wide exposed surface. Black vinyl fillers shall be furnished as required, when standard 1 1/2" (38.1mm) tread spacing cannot be maintained. Installer shall use recommended latex screed to ensure level base. Frame color shall be supplied in clear anodized finish.

2.06 TREAD INSERT OPTIONS

A. VA Abrasive Tape Inserts- shall include flexible abrasive grit tape, bonded to a rigid aluminum tread insert. Color to be Black 8401.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

B. Refer to Section 01 31 00 – Project Management & Coordination

C. Refer to Section 01 73 00 - Execution

3.02 PREPARATION

A. Manufacturer shall offer assistance and guidance to provide a template of irregular shaped mat/grid assemblies to ensure a proper installation.

3.03 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer's recommendations.

B. Set mat/grid at height recommended by manufacturer for most effective cleaning action.

C. Coordinate top of mat/grid surfaces with bottom of doors that swing across to provide ample clearance between door and mat/grid.

3.04 CLEANING

A. It is important to the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

B. Waste Management: Collect field generated construction waste created during construction or final cleaning in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

3.05 PROTECTION

A. After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recess, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

B. Defer installation of floor mats/grids until time of substantial completion of project.

3.06 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

END OF SECTION

12 61 00
TREAD MOUNTED SEATING SPECIFICATIONS

1.1 WORK INCLUDED

A. Manufacture, deliver and install Fixed, Tread Mounted Gymnasium Seating in accordance with applicable codes, the following specifications, and approved drawings.

1.2 RELATED WORK BY OTHERS

A. Adequate riser levelness and strength for support of gym seats.

1.3 SYSTEM DESCRIPTION

A. The gym seat system shall be multiple tiered seating rows comprised of concrete construction with plastic seat modules attached using proper attachment brackets and anchors.

1.4 QUALITY ASSURANCE

A. DESIGN LOAD CRITERIA(STRUCTURAL):
    1. NFPA Standard: Comply with requirements of NFPA 102, "Standard for Assembly Seating, Tents and Membrane Structures", and specifically with Chapter 5, "Folding and Telescopic Seating", except where other requirements are indicated by the architect/owner.
    2. Seating layout design shall be in compliance with Code/Year National Building Code.
B. Manufacturer: Company specializing in telescopic seating with a minimum of 25 years experience in manufacturing gym seats.
C. Engineer Qualifications: Manufacturer to employ a registered, licensed Professional Engineer to certify that the equipment to be supplied meets or exceeds the design criteria of this specification.
D. Installation: Shall be handled directly by the manufacturer or by a factory certified installation subcontractor.
E. Product Liability: Certification of insurance coverage of not less than $5,000,000. .
F. Welding Processes: To be performed by certified professional welding operators in accordance with American Welding Society, (AWS), D1,1 "Structural Welding Code-Steel".
G. Product Improvements: Equipment provided shall incorporate manufacturer's design improvements and materials current at time of shipment, provided that such improvements and materials are consistent with the intent of these specifications.

1.5 Submittals

A. BID SUBMITTALS
    1. Manufacturer's descriptive literature and specifications.
    2. List of deviations from these specifications, if any.

B. JOB SUBMITTALS
    1. Shop Drawings showing all equipment to be furnished with details of accessories to be supplied.
    2. Samples of material and color finish as requested by Architect.
    3. Warranty, operation and maintenance instructions to the owner upon completion.

1.7 WARRANTY

A. The manufacturer shall warrant all work performed under these specifications to be free of defects for a period of Five years.

B. Any materials found to be defective within this period will be replaced at no cost to the owner. This warranty shall not include replacements required by Acts of God, war, vandalism, flood, fire, calamity or deliberate abuse or misuse of the equipment.

2.1 ACCEPTABLE MANUFACTURERS

A. All gym seats shall be manufactured by Irwin Telescopic Seating Company, Altamont, IL 62411 or equal, subject to prior approval and compliance with these specifications.

2.2 MATERIALS

A. Seating Area: Supply ____ 18" Fixed injection molded plastic seat modules including support brackets and mounting hardware for permanent concrete risers. Plastic seats to be tread mounted directly to the concrete surface, with all mounting hardware properly positioned as to not cause structural damage to the concrete surface.

B. Dimensions:
   1. Rise per Tread: 14, 16 Inches
   2. Tread Spacing: ?? Inches

2.3 FABRICATION

A. Seat Systems:
   1. Infinity Seat: Supply plastic modular 10" deep by 18" individual seats. Seating to be scuff resistant injection molded high density polyethylene plastic.
      a. Seat modules supplied shall be of a high aesthetic design using multiple textures, style lines and a water fall front. The rear of the seat shall be slightly curved to eliminate the straight-line appearance and include a moderate seat contour and texture to enhance spectator comfort.
      b. Seating design shall be molded to achieve a finished end appearance without the use of end caps. The rear of the seat shall include a smooth wall allowing for the deck to be easily swept clean without obstruction.
      c. Each seat shall have the capability of using seat numbers and row letters at the aisle locations. Seat numbers to be stylishly designed using a radius corner to enhance the aesthetic value of the seat. Seat numbers and row letters shall be recessed into the seat to protect against any vandalism.
      .

3.1 REVIEWS AND APPROVALS

A. Shop drawings shall be approved and job site field measurements taken prior to installation, and fixed gym seating shall be installed in conformance therewith.

3.2 INSTALLATION

A. The installation of the fixed gym seating will be handled directly by the manufacturer or by a factory authorized installation subcontractor qualified to perform the installation function.

3.3 PROTECTION

A. Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer's representative.

B. Maintenance and operation of the fixed gym seating shall be the responsibility of the owner or his duly authorized representative, and shall include the following:
    1. An annual inspection and required maintenance of all fixed gym seating shall be performed to assure safe conditions. At least bi-annually the inspection shall be performed by a Professional Engineer or factory service personnel.

C. Irwin Telescopic Seating Company constantly strives to improve its product and manufacturing methods; therefore, it reserves the right to make changes without notice which, in the opinion of Irwin Seating Company, shall improve the product.

END OF SECTION

12 66 00
VersaTract Telescopic Seating Specification

1.1 WORK INCLUDED
- A. Manufacture, deliver and install Telescopic Seating Systems in accordance with applicable codes, the following specifications, and approved drawings.

1.2 RELATED WORK BY OTHERS
- A. Adequate floor levelness and strength for operation of telescopic seating.
- B. Adequate wall strength for attachment and operation of wall attached telescopic seating.
- C. Electrical wiring within the building as required for power operated telescopic seating.

1.3 SYSTEM DESCRIPTION
- A. Telescopic seating system shall be multiple tiered seating rows comprised of seat and deck components, risers, and supportive understructure.
- B. Telescopic seating shall be operable on the telescopic principle, stacking vertically in minimum floor area when not in use.
- C. The first moving row, on manual sections, shall be secured with release lever. All other rows shall be mechanically locked, operable only upon unlocking and cycling of first row. Power sections shall be secured with mechanical locks as well as the power system, operable upon activating the pendant control.

1.4 QUALITY ASSURANCE
- A. DESIGN LOAD CRITERIA (STRUCTURAL):
  International Building Code Standard: Comply with requirements of IBC / ICC 300, Chapter 4 "Standard for Bleachers, Folding and Telescopic Seating and Grandstands Assembly Seating," except where other requirements are indicated by the architect/owner.
- B. Manufacturer: Company specializing in telescopic seating with a minimum of 25 years experience in manufacturing telescopic seating.
- C. Quality Standards: Manufacturer to be I.S.O. 9001:2008 certified.
- D. Engineer Qualifications: Manufacturer to employ a registered, licensed Professional Engineer to certify that the equipment to be supplied meets or exceeds the design criteria of this specification.
- E. Installation: Shall be handled directly by the manufacturer or by a factory certified installation subcontractor.
- F. Product Liability: Certification of insurance coverage of not less than $5,000,000.
- G. Welding Processes: To be performed by certified professional welding operators in accordance with American Welding Society, (AWS), D1,1 "Structural Welding Code-Steel."
- H. Product Improvements: Equipment provided shall incorporate manufacturer's design improvements and materials current at time of shipment, provided that such improvements and materials are consistent with the intent of these specifications.

1.5 SUBMITTALS
- A. BID SUBMITTALS
  1. Manufacturer's descriptive literature and specifications.
  2. List of deviations from these specifications, if any.
  3. Certification of Insurance.
  4. I.S.O. 9001:2008 Certification.

- B. JOB SUBMITTALS
  1. Shop Drawings showing all equipment to be furnished with details of accessories to be supplied including necessary electrical service to be provided by others. All electrical submittals must include U.L. listing number.
  2. Samples of material and color finish as requested by Architect.
  3. Warranty, operation and maintenance instructions to the owner upon completion.

1.6 DESIGN CRITERIA

A. Telescopic seating shall be designed to support, in addition to its own weight, and the weight of added accessories, a uniformly distributed live load of not less than 100 lbs. per sq. ft. (4.8 kN per sq. m.) of gross horizontal projection. Seat boards and footrest shall be designed for a live load of not less than 120 lbs. per linear foot (1.751 kN per linear m).

B. Sway force applied to seats shall be 24 lbs. per linear ft. (350 N per linear m.) parallel to the seats and 10 lbs. per linear ft. (146 N per linear m.) perpendicular to the seats. Sway forces shall not be considered simultaneously applied.

C. Railings, posts and sockets designed to withstand the following forces applied separately.

D. Handrails shall be designed and constructed for:

1. A concentrated load of 200 lbs. (890 N) applied at any point and in any direction.
2. A uniform load of 50 lbs. per ft. (730 N/m) applied in any direction.
   The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

E. Guards shall be designed and constructed for:

1. A concentrated load of 200 lbs. (890 N/m) applied at any point and in any direction along the top railing member and; a uniform load of 50 lbs. per ft. (730 N/m) applied horizontally at the required guardrail height and simultaneous uniform load of 100 lbs. per ft. (1460 N/m) applied vertically downward at the top of the guardrail. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

F. American Institute of Steel Construction (AISC), American Iron and Steel Institute (AISI) and Aluminum Association (AA) design criteria shall be the basis for calculation of member sizes and connections.

G. Wood members shall be designed in accordance with National Forest Products Association, (NFOPA), and National Design Specification for Wood Construction.

1.7 WARRANTY

A. The manufacturer shall warrant all work performed under these specifications to be free of defects for a period of one year.

B. All understructure components shall be warranted for a period of ten years.

C. Any materials found to be defective within this period will be replaced at no cost to the owner. This warranty shall not include replacements required by Acts of God, war, vandalism, flood, fire, calamity or deliberate abuse or misuse of the equipment.

2.1 ACCEPTABLE MANUFACTURERS

A. All seating shall be VersaTract Telescopic Seating System as manufactured by Irwin Seating Company - Telescopic Division, Altamont, IL 62411 or equal, subject to prior approval and strict compliance with these specifications.

2.2 MATERIALS

A. Seating Area: As noted on the plans.

B. Dimensions:

1. Row Spacing: _____(24, 26) Inches
2. Rise per row: _____(10, 12) Inches

2.3 FABRICATION

A. Understructure System:

1. Steel supports and rolling frames shall be constructed from formed steel of the size and shape necessary to support the design loads. All support bracing shall begin at Row 2 and be of diagonal or "knee" type for rigidity. Diagonal bracing to be minimum 1 1/2” x 1 1/2" 14-gauge square tubing. Bracing fabricated from open-sided channel, angle iron or flat strap "X" type bracing is unacceptable.
2. Wheels shall not be less than 5" diameter x 1 3/8" non-marring soft rubber face to protect wood or synthetic floor surfaces. Each operating row shall have a minimum of 6 wheels.
3. Each fully skirted wheel channel shall be formed 12-gauge steel and continuously in contact with adjacent channels by means of an Integral Alignment System (IAS) and include nylon glides to

eliminate any metal to metal contact. The IAS maintains proper alignment between adjacent wheel channels for smooth and consistent operation while eliminating the potential for accidental row separation. Wheel channel alignment systems with metal to metal contact requiring periodic lubrication or that utilizes a guide rod system that can be bent or damaged will not be acceptable.

4. Each cantilever arm shall be triple-formed 10-gauge steel, securely welded to the post assembly and include a nylon cantilever pad to ensure smooth operation. The cantilever pad shall also provide a firm base when in the occupied position and provide a solid feel when walked on.
5. Vertical columns shall be high tensile steel structural tube to meet design criteria. Minimum column size to be 2" x 3" 14-gauge structural tube, welded to a 2' wide wheel channel using 360 degrees of weldment.
6. Deck support members shall be double formed 14-gauge steel and connect the front nosing and rear riser members. Each deck support shall include a unique dual-purpose roller that provides smooth support during operation. The deck support roller shall also include a 3/4" wide shoulder that's encapsulated by the deck support on the row above in order to maintain proper upper alignment while delivering consistent, repeatable operation.

B. Seat Systems:
   1. Infinity Seat: Supply plastic modular 18" long individual seats. Seating to be scuff resistant injection molded high density polyethylene plastic.
      10" wide Infinity Seat to be supplied

      a. Seat modules supplied shall be of a high aesthetic design using multiple textures, style lines and a waterfall front. The rear of the seat shall be slightly curved to eliminate the straight line appearance and include a moderate seat contour and texture to enhance spectator comfort.
      b. Seating design shall be molded to achieve a finished end appearance without the use of end caps. The rear of the seat shall include a smooth wall allowing for the deck to be easily swept clean without obstruction.
      c. Seat heights shall be maintained at a minimum of 16 3/4". Lower seat heights which detour from spectator comfort will not be accepted.
      d. Foot space shall be maximized for spectator comfort and provide a minimum of 22" when measured with a 10" module and 21" with a 12" module.
      e. Each seat to be designed with the capability of using seat numbers and row letters at the aisle locations. Seat numbers to be stylishly designed using a radius corner to enhance the aesthetic value of the seat. Seat numbers and row letters shall be recessed into the seat to protect against any vandalism.
      f. Select seating colors from manufacturer's 15 standard colors. Custom colors available as an option.
      g. Securely fasten each seat to the nose beam using a 10-gauge formed steel bracket and locking hardware. Adjacent seating shall be interlocked together along the full perimeter eliminating any fore or aft movement or the potential of any pinching hazard.
      h. Seat modules shall be designed to support a uniform load of 600 lbs per seat and a concentrated load of 150 lbs over 4 square inches.

C. Deck System:
   1. Panelam decking shall have a 0.030 (30 thousandths) high density polyethylene overlay, permanently bonded over 5-ply structural western fir plywood in strict compliance with U.S. Product Standard PS 195. Finish thickness to be 5/8". Plywood shall be supported along the front and back edge for maximum rigidity and designed in a manner that allows 3 plies to run front to back for increased deck strength. Each plywood panel shall be connected using a tongue and groove splice leaving the deck clean and free of any tripping or cleaning obstructions. Decking shall be secured in place by the encapsulation of the rear riser and mechanical fasteners along the front edge. Panelam to be selected from manufacturer's four standard colors.

D. Nosing:
   1. Nosing shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish.

E. Rear Risers:
   1. Rear riser shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish.

F. Finish: For rust resistance in standard conditions all painted surfaces shall be finished in textured Epoxy Powder Coated Semi-Gloss Black.

1.4 ACCESSORIES

A. Aisles shall be footrest level. Aisles at the footrest level shall include non-slip treads on the top front edge.
B. Intermediate aisle steps shall be provided. Steps are permanently attached closed design. Steps shall be constructed from 14 ga. steel, finished in a Black powder coated epoxy, and designed to eliminate any possible toe catch between the top of the intermediate step and the bottom of the nose beam per ADA or other applicable codes. Front step shall be removable and interlock to the front row eliminating any possibility of accidental disengagement, and store on the front row when not in use.
C. Aisle handrails.
   1. Smart Rail aisle handrails shall be provided for 22” to 26” row spacing. Aisle railings shall quickly and easily rotate 90 degrees to the locked position and store parallel to the front of the aisle. Railings that require removal from the pocket or the use of tools for storage will not be acceptable. Aisle railings shall be an individual rail design, located on every other row starting at row two (2). Railing to be constructed of 1 1/2” 11 ga. round steel tubing, finished in a textured powder coated epoxy. For safety, railings designed without a full return of the handrail will not be acceptable.
   2. Wheel Chair Seating
      Recoverable wheel chair spaces shall be provided at the section joint location or section length as shown on plans. An integral support on row two shall be provided to eliminate structural damage to the understructure during the operation and use of the system. Recoverable seating areas do not require front railings for support.

E. End rails.
   1. End rails of the self-storing type, finished with textured epoxy powder-coated black enamel, shall be provided at the open ends of the group. End rails shall start at row three and meet all national building codes. Railings with flexible uprights that can be expanded beyond the 4” sphere are not acceptable.

1.5 PROPULSION SYSTEM

1.6

A. FRICTION POWER: Integra Drive System (IDS) shall be furnished on each seating group to open and close the telescopic units. Each individual section shall include 2 IDS friction drive systems integrated into the first moving row of understructure to achieve smooth and efficient operation. Operation of the seating shall be accomplished with the use of a walk along pendant control.
   1. Each IDS power system shall include large 6 1/2" diameter friction rollers to develop tractive force adequate to open and close the system. Each roller to include non-marring 1/2" thick rubber covering.
   2. Electrical motors for each section shall be heavy-duty and high efficiency gear reduction motors. The shaft diameter for the gear motor and rollers shall be a minimum of 1” and be connected by a 1” schedule 40 drive shaft.
   3. All roller chain and sprockets used throughout the drive system shall be a minimum of #40 in size. Each drive unit shall be designed to include a safety shroud around the chain and sprocket for overall safety.
   4. The power units shall develop tractive forces adequate to operate the seating units under normal conditions but inadequate to operate should significant obstacles be encountered.

B. Manufacturer shall provide all wiring from power source within bleacher seating including pendant control. Removable pendant control shall be handheld with forward and reverse button, plugging into a single receptacle. Electrical contractor shall provide a 60 HZ power source (as specified below) behind each group of seating. Amperage to be as specified by seating manufacturer depending on the number of power units required. For wall-attached installations, power source to terminate in a surface mounted junction box above floor. For reverse units, power source to terminate in a junction box, flush mounted under first seating row in center of group. Electrical contractor shall perform the connections to the seating equipment at the junction box. All electrical parts and wiring shall be installed in complete accord with the National Electric Code. U.L. Listing FHJU.E479554.

Supply power system with 120V single phase system.

3.1 REVIEWS AND APPROVALS

A. Shop drawings shall be approved and job site field measurements taken prior to installation and telescopic gym seating shall be installed in conformance therewith.

3.2 INSTALLATION

A. The installation of the telescopic gym seating will be handled directly by the manufacturer or by a factory authorized installation subcontractor qualified to perform the installation function.

3.3 PROTECTION

A. The manufacturer’s representative shall transmit instructions in both operation and maintenance to the owner.

B. Maintenance and operation of the telescopic gym seating shall be the responsibility of the owner or his duly authorized representative, and shall include the following:

1. During operation of the telescopic gym seating, the opening and closing shall be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturer's instructions.
2. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the telescopic gym seating.
3. An annual inspection and required maintenance of all telescopic gym seating shall be performed to assure safe conditions. At least bi-annually, the inspection shall be performed by a Professional Engineer or factory service personnel.

C. Irwin Telescopic Seating Company constantly strives to improve its product and manufacturing methods; therefore, it reserves the right to make changes without notice which, in the opinion of Irwin Seating Company, shall improve the product.

END OF SECTION

SECTION 131100
SWIMMING POOLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.2 SUMMARY OF WORK *(for general guidance-not all inclusive*)

A. Introduction

1. Provide all labor, materials, equipment and services necessary to construct the following: (1) a competition pool, (2) a dive pool, and (3) a prefabricated Endless Pool on deck (Alternate #2). This work shall include the structure(s) and installation of pool finishes as well as all products listed in Part 2 of Section 131100.

B. Work included in this section

1. It is the intent of this section to place the entire responsibility for the construction of the pool(s) (including the construction of the pool shell(s)) under one vested CONTRACTOR. Under this section the Swimming Pool Contractor will provide but is not necessarily limited to the following:

a. Provide all equipment and services required for erection and delivery onto the premises of any equipment or apparatus provided. Remove equipment from premises when no longer required.

b. Layout, excavate, remove from the construction site, replace and grade materials as required beyond the limits of excavation of the pool shell(s) to complete the work described in this section. Reference Division 31 - Earthwork.

c. Grade and replace load bearing or high plasticity index soil, pump and dewater as necessary to keep excavations free from water during construction. Reference Division 31 - Earthwork.

d. Provide and maintain proper shoring and bracing for existing utilities, sewers and building foundations where required for related excavations. Reference Division 31 - Earthwork.

e. Provide all electrical conduit, wiring, junction boxes etc. to all low voltage pool equipment within pool filter/chemical rooms per Division 26 - Electrical. (Low voltage is considered less than 110 V.)

f. Coordinate for all required bonding and grounding of the pool shell, fittings, and equipment.

g. Provide all necessary piping and valving as shown on the drawings and specified herein.

h. Provide individually sized housekeeping pads for each pool pump.

i. Provide the main drain hydrostatic relief system and a sight sump as shown on the drawings. Reference Division 31 - Earthwork.

j. Construct the cast-in-place concrete pool shell(s) and surge tank(s) as described in these specifications and detailed on the drawings, including reinforcement steel, inserts, fittings, main drain sumps and all embedded items (piping, anchors, spargers, etc.) for the pool(s). Reference Division 3 - Concrete and Structural. Before commencing the placement of concrete, verify electrical bonding of the pool embedded items and reinforcing steel. Also, coordinate and arrange any required electrical,

plumbing and or building inspections. Backfill and compact fill around the pool structure, piping trenches and excavations required by this work. Reference Division 31 - Earthwork.

k. Provide a proprietary aggregate cementitious finish in the pool(s) with a vertical tile band. Provide specialty tile for the perimeter tile deck band, end wall parapet, gutter nosing, wall targets, recessed steps, floor lane markings, depth markings and warning signs, water polo markings, stanchion and water polo identification, construction joint installation bands and all other tile installation within the pool structures. Reference Section 131103 - Swimming Pool Tile - including the tolerance requirements for the concrete substrate.

l. Install springboard diving apparatus complete and in compliance with the requirements of FINA/USA Diving/NCAA/NFHS. Install slip-resistant platform surfacing material for dive tower platforms and springboard pedestal surfaces.

m. Assemble and install the cleaning and maintenance equipment for the pool(s) as specified herein.

n. Provide for the storage of all pool related equipment, materials and systems. All items are the responsibility of the CONTRACTOR until accepted by owner.

o. Obtain final acceptance by jurisdictional health department(s).

p. Start, test, calibrate and adjust all mechanical equipment, electrical equipment, recirculation, chemical, and other supplied systems including deck, loose, maintenance, and safety equipment. Instruct the Owner's representative in the systems operation and maintenance as described herein.

q. Provide a one-year license and basic startup training for aquatic facility management application.

r. Provide the auxiliary gas-fired heaters for the pool(s). Include all piping, heaters, heat exchangers, booster pumps, controls, gauges, thermostats, control valves and wiring required to draw water from the recirculation line, heat the water and return it back to the recirculation line and interlock with pool recirculation pumps.

C. Related work specified in other sections

1. Section 131103 – Swimming Pool Tile

2. Section 131104 – Swimming Pool Cementitious Finish

3. Section 131106 – Swimming Pool Timing System

4. The following work related to the swimming pools shall be completed by other trades.

a. The concrete construction of the complete platform dive tower, concrete springboard pedestals, associated stair systems, railing systems, and foundations shall be by the General Contractor with coordination of the strict dimensional requirements as indicated in the swimming pool drawings to meet the governing standards of USA Swimming and NCAA. Installation of the slip resistant surfacing materials on the platforms and springboard pedestals shall be by Swimming Pool Contractor or qualified flooring installation contractor. Refer to specification paragraph 2.24, this section. Installation of springboard short stands shall be by Swimming Pool Contractor.

b. Provide, erect and maintain all necessary barricades, signs, lights and flares for pool construction to protect workers and the public.

c. Provide and maintain proper shoring and bracing for existing utilities, sewers and building foundations where required for swimming pool related excavations. Reference Division 31 - Earthwork.

d. Provide sub-surface drainage as needed or required in the project geotechnical report. Reference Division 31 - Earthwork.

e. Construct pump pit and backwash pit including reinforcement, inserts, wall sleeves, anchors, access hatches, and fittings. Reference Division 3 - Concrete.

f. Layout, excavate, remove from the construction site, replace and grade materials as required beyond the limits of excavation of the pool shell(s) to complete the work described in this section. Reference Division 31 - Earthwork.

g. Prior to concrete pours, verify electrical bonding of the pool embedded items. Coordinate and arrange any required electrical, plumbing and or building inspections to be performed on embedded items. Reference Division 26 - Electrical.

h. Provide sanitary sewer and storm drain connections. Reference Division 22 - Plumbing.

i. Provide deck finish beyond perimeter tile band. Reference Division 32 - Exterior Improvements.

j. Provide rules and regulations signage as required by code. Reference Division 1 - General Requirements.

k. Provide chlorine resistant caulking (sealant) and backer rod on pool decks. Reference Division 7 - Thermal and Moisture Protection.

D. Related work specified in Plumbing section. Reference Division 22 - Plumbing. Work to be completed by other contractors.

1. Provide trench drains and area drains on pool deck.

2. Provide sanitary sewer piping from the filter room including floor drains, and /or any required sumps and sump pumps.

3. Provide water service to all hose bibbs, flush hydrant boxes and auto-fill bypass to air gap above fill funnel(s). Install the slow closing solenoid valve(s) in the bypass auto-fill piping.

4. Install Plumbing Contractor supplied water meter on the fresh water supply line upstream of the manual fill valve and the slow closing solenoid valve.

E. Related work specified in Mechanical section. Reference Division 23 – HVAC. Work to be completed by other contractors.

1. Provide the primary (HVAC dehumidification rejected heat) heating system for the pool(s). Work to include all piping from the installed pool dehumidification loop tees, dehumidification units, booster pumps, controls, gauges, thermostats, control valves and wiring required to draw water from the recirculation line, heat the water and return it back to the recirculation line and interlock with pool recirculation pumps. Coordinate control sequencing for auxiliary pool heaters with that of primary heat source.

2. Provide air recirculation systems for pool related spaces.

F. Related work specified in Electrical sections. Reference Division 26 – Electrical. Work to be completed by other contractors.

1. Provide power to the exhaust fans for the chemical rooms.

2. Provide motor starters, auxiliary contacts, magnetic relays and other electrical control devices necessary for the complete operation of the pool systems. Install power to Variable Frequency Drive pool pump starters and power from VFD to the pool pump motor.

3. Ground and bond all pool structures, fittings and equipment in accordance with Article 680 of the N.E.C. Test and verify that the system electrical ground is true and solid. Provide certification to this effort.

4. Obtain permits, inspections, and approvals of all wiring including grounding and bonding of all metal components associated with the pool in accordance with Local, State and National Electrical Codes.

5. Install power, conduits, electrical boxes, and wiring for the Contractor furnished electronic timing and scoreboard system with multi-sport capability for race swimming, diving, water polo, pace clock, and synchronized swimming.

6. Install power, conduits, electrical boxes, and wiring for the Contractor furnished underwater lights and junction boxes.

7. Confirm all electrical conduits that penetrate the pool shell are watertight and installed per N.E.C. Article 680.

1.3 QUALITY ASSURANCE

A. The specifications and drawings illustrate and detail three (3) swimming pool systems that shall be utilized for competitive and instructional use. Certain technical aspects of the design are common only to pool systems planned for public use. Understanding these aspects, their functions and interaction through experience is vital to completing a successful operating system. It is a mandatory requirement that all bidders will have achieved such experience as a prerequisite for bidding this project.

1. CONTRACTOR to refer to section 002113 – INSTRUCTIONS TO BIDDERS for bonding requirements.

2. If the Contractor has not received prior written approval for this project or has not been included in the pre-approved list of Contractors, they must submit a list of projects meeting the aforementioned qualifications, including contact information of the General Contractor shall be submitted for review and approval at least 15 days prior to bidding of the project. The Contractor must have completed at least five (5) public-use competition pools with individual water surface areas in excess of 13,000 square feet and a depth of 13’-0” or more within the past 10 years.

3. The Contractor must submit prior to the start of construction the name of the on-site Project Superintendent including their relevant experience. The Contractor’s on-site Project Superintendent must have completed at least five (5) public-use competition pools with individual water surface areas in excess of 13,000 square feet and a depth of 13’-0” or more within the past 10 years. A list of projects meeting the aforementioned qualifications, including contact information of the General Contractor as well as Owner shall be included with the experience submittal. Project Superintendent must not change on the project unless written authorization has been provided by the Architect and Owner.

4. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligation of the contract and to complete the work described or if the bidder does not have the qualifications stated herein. Subject to compliance with item 2 above on this specification.

5. The following bidders have been pre-approved. All bidders shall meet the requirements listed above.

Acapulco Pools
Bernie Gall, Teresa Palubeskie
1550 Victoria Street North
Kitchener, Ontario
N2B 3E2 Canada
p: 519.743.6357
f: 519.743.9698
e: bernie@acapulcopools.com

Atlantis Aquatic Group
Terry Smith, Dennis Watson
7700 Hwy 71 West
Austin, TX 78735
p: 512.243.6877
f: 210.579.7308
e: terry@atlantisaquaticgroup.com

Progressive Commercial Aquatics
Tim Phelps, Steve Davis

Sunbelt Pools
Rob Morgan
10555 Plano Rd

2510 Farrell Road
Houston, TX 77073
p: 512.848.4677
f: 281.443.1524
e: tim.phelps62@gmail.com

Weller Pool Constructors, Inc
Nils Erickson, Jack Oren
1821 South Orange Blossom Trail
P.O. Box 16008
Apopka, FL 32703
p: 407.880.8800
f: 407.884.7306
e: jack@wellerpools.com

Dallas, TX 75238-1305
p: 214.343.1133
f: 214.343.1201
e: robm@sunbeltpools.com

Wescon Construction, Inc
Steve Kraft
4815 Hawkins St NE # C6
Albuquerque, NM 87109
PO Box 90337
Albuquerque, NM 87199
p: 505.345.2511
f: 505.345.2512
e: wescon1@comcast.net

1.4 REGULATORY AGENCY REQUIREMENTS AND ENGINEERING SERVICES

A. The system shall comply with all necessary pre-construction approvals obtained by the Owner and Owner's Consultants from local regulatory agencies governing the design and construction of public swimming pools.

B. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, and other costs in connection with his work, including the filing of all necessary as-built drawings, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction over their work. The Contractor shall also be responsible for obtaining all required certificates of inspection for his work and deliver same to the Owner and Owner's Consultants before requesting acceptance and final payment for the work.

C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus or drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

1.5 COORDINATION AND CLARIFICATION

A. Coordinate with other contractors or subcontractors all work relating to this section.

B. The Contractor must establish with other contractors or subcontractors, having related work in this section, that all work necessary to complete the pool(s) as shown on the drawings and in the specifications is included in the base bid and alternates to the Owner.

C. If in doubt regarding the responsibility for work covered in this section and/or discovery of errors or omissions in the bidding documents, the Contractor shall notify the Architect through channels established by the specifications and request a clarification ten (10) days prior to the bid date.

1.6 ALTERNATES

A. Review the description of the alternates in Division 1 and on the drawings for possible effect upon work in this section. Alternates related to the work in this section are described in this division and on the bid proposal form.

B. Pool Alternates

1. Alternate #2: Provide Elite Endless Pool System complete with equipment system, chemical system, UV, filtration, pumps and all necessary piping connections to provide a completely operable pool system. Reference client #2561428. Contact John Satir with Endless Pools, 800.732.8669 ext 292.

1.7 CONTRACTOR'S ALTERNATE PROPOSAL

A. Contractor shall submit his bid to the owner based on materials, equipment and methods as specified in this Section. No substitutions of material will be allowed.

B. It is the intent of the contract documents to encourage competition. The base proposal must be on providing the construction methods and equipment as specified and detailed. Any proposed system substitution must have prior written approval by the Architect.

C. If there is any deviation from the basis of design equipment it is the responsibility of the contractor to confirm that all engineering criteria are appropriate for the substituted equipment.

D. All proposed substitutions of specified construction methods and equipment shall include a complete submittal as required by these specifications and drawings of appropriate scale incorporating all required changes. The Contractor shall provide a list of at least ten (10) satisfactory installations comparable to this project that have been manufactured and installed under the manufacturer's current legal name. Submit a list of such projects with the name, address and current telephone number of the Owner's Operator and Architect of Record to the Architect on the bid date.

E. Any changes or modifications to the Contract Documents that are not authorized by the architect shall be the sole responsibility of the Contractor.

1.8 SUBMITTALS

A. All submittals shall be made in accordance with the requirements of Division 1 - General Requirements and in strict compliance with the following procedures and guidelines.

B. One (1) set of shop drawings and engineering data shall be tabbed, indexed, and referenced to the specifications, compiled into an electronic submittal, and submitted in two stages. The first stage shall include all items for the pool shell(s), reference swimming pool structural specifications. The second stage shall be for all remaining items. Each section of items shall be prefaced by a cover sheet listing the items submitted within the section. All electronic submittals shall be organized, numbered, and submitted in the same format and order as the project specifications. Only complete sets will be reviewed.

1. Engineering data covering all systems, equipment, structures and fabricated materials, which will become a permanent part of the work under this contract, shall be submitted for review. This data shall include drawings and descriptive information in sufficient detail and scale to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorage and supports required; performance characteristics; fabrication and dimensions needed for installation and correlation with other materials and equipment. A certification, in writing, shall be provided indicating that all equipment will fit in the space allotted and as shown on the drawings.

2. All submittals regardless of origin shall be stamped with the approval of the CONTRACTOR and identified with the name and number of this contract, CONTRACTOR'S name, and references to applicable specification paragraphs and contract drawings. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

3. The submittals will not be accepted from anyone but the CONTRACTOR. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

4. The CONTRACTOR'S stamp of approval is a representation that the CONTRACTOR accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, and that he has reviewed or coordinated each submittal with the requirements of the work and the contract documents.

5. Each submittal shall include a statement prepared by the originator of the drawings and data, certifying compliance with the contract documents except for deviations, which are specifically identified.

6. All deviations from the contract documents shall be identified on each submittal and shall be tabulated in the CONTRACTOR'S letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate

essential details of all changes proposed by the CONTRACTOR (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

7. The CONTRACTOR shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all exceptions previously noted have been taken into account. In the event that more than one resubmission is required because of failure of CONTRACTOR to respond to exceptions and rejections previously noted, CONTRACTOR shall make all further resubmissions in person at the consultant's office.

8. Any need for more than one resubmission, or any other delay in obtaining review of submittals, will not entitle the CONTRACTOR to an extension of the contract time unless delay of the work is directly caused by a change in the work authorized by a change order.

9. Review of drawings and data submitted by CONTRACTOR will cover only general conformity to the drawings and specifications, external connections and dimensions that affect the layout. Review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device or item shown. Review of submittals shall not relieve CONTRACTOR from responsibility for errors, omissions, or deviations, or responsibility for compliance with the contract documents.

10. When the drawings and data are returned marked REJECTED, REVISE AND RESUBMIT or SUBMIT SPECIFIED ITEM, the corrections shall be made as noted thereon and as instructed and six corrected copies (or one copy and one corrected reproducible copy) resubmitted.

11. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the resubmittal. All resubmittals shall be indexed, tabbed, referenced to the specifications and bound in a three-ring binder and submitted at one time.

12. When corrected copies are resubmitted, the CONTRACTOR shall, in writing, direct specific attention to all revisions and shall list separately any revisions made other than those called for on previous submissions.

13. When the drawings and data are returned marked NO EXCEPTIONS TAKEN or MAKE CORRECTIONS NOTED, no additional copies need to be furnished unless specifically requested to do so for record.

C. Permits, Receipts and Test Reports

1. Provide the Architect with copies of all permits and receipts for fee payments.

2. Submit a sample format for each test report intended for use. Submit test reports required herein only on approved forms.

D. Include complete product data indexed, tabbed, and referenced to specifications with 8 ½" x 11" cover sheet covering:

1. Paragraph 2.01 - Overflow System

2. Paragraph 2.02 - Pumping Equipment

3. Paragraph 2.03 - Filtration Equipment

4. Paragraph 2.04 - Recirculation Fittings

5. Paragraph 2.05 - Piping Systems

6. Paragraph 2.06 - Chemical Treatment Systems

7. Paragraph 2.07 - Chemistry Monitoring and Control Systems

8. Paragraph 2.08 - Flow Meters

9. Paragraph 2.09 - Water Level Controllers

10. Paragraph 2.10 - Inserts and Anchor Sockets

11. Paragraph 2.11 - Deck Equipment

12. Paragraph 2.12 - Loose Equipment

13. Paragraph 2.13 - Maintenance Equipment

14. Paragraph 2.14 - Safety Equipment

15. Paragraph 2.15 - Thermometers

16. Paragraph 2.16 – Swimming Pool Finishes

17. Paragraph 2.17 - Waterproofing

18. Paragraph 2.18 – Sealants

19. Paragraph 2.19 – Aquatic Facility Management Application

20. Paragraph 2.20 - Underwater Lights

21. Paragraph 2.21 - Movable Bulkhead

22. Paragraph 2.22 - Pool Compressed Air Bubbling System – Sparger

23. Paragraph 2.23 - Pool Heaters

24. Paragraph 2.24 - Dive Platform Surfacing

E. Include engineering/construction drawings for the pool structure.

1. Reference Division 3 - Concrete.

F. Include engineering construction drawings for all pool piping.

G. Reference Section 131103 – Swimming Pool Tile

H. Reference Section 131104 – Swimming Pool Cementitious Finish

I. Reference Section 131106 – Swimming Pool Timing System

1.9 OPERATION AND MAINTENANCE MANUALS AND CLOSE-OUT SUBMITTALS

A. Detailed operation and maintenance information shall be supplied for all equipment requiring maintenance or other attention. The equipment supplier and/or CONTRACTOR shall prepare an operation and maintenance manual for all equipment. Parts lists and operating and maintenance instructions shall be provided.

B. Each operation and maintenance manual shall include the following:

1. Equipment function and calibration, normal operating characteristics, and limiting conditions.

2. Assembly, installation, alignment, adjustment and checking instructions.

3. Operating instructions for start up, routine and normal operation, regulation and control, shut down and emergency conditions.

4. One (1) copy of all instructional videos.

5. Operating cycles shall be specifically described in outline format and in referenced detail. A wall-mounted color-coded piping flow diagram shall be provided in the pool equipment room. The diagram shall be engraved on laminated plastic with color-coded piping to match color of coding on piping, and including valves identified with number on tags. The minimum size shall be 11 inch x 17 inch.

6. Include manufacturer recommended maintenance schedule, parts lists, piping diagram (to agree with wall mounted diagram) and trouble-shooting information for all pool mechanical equipment.

7. Using reference to keyed valves and wall diagram, include specific written instructions for procedures to be followed for the following:

   a. Emptying and refilling the pool(s) including de-watering during the period that the pool(s) will be empty;

   b. Water level control adjustment and chemical control operation;

   c. Normal surge tank operation and balancing;

   d. Filter operation and backwashing; and

   e. Super chlorination.

8. Lubrication and maintenance instructions.

9. Guide to “trouble-shooting”.

10. Parts list and predicted life of parts subject to wear.

11. Outline, cross section, and assembly drawings; engineering data and wiring diagrams.

12. Test data and performance curves, where applicable.

13. Specific written instructions for procedure for emptying and refilling the pool(s) including de-watering during any period that the pool will be empty. Include furnishing and installing a yellow warning sign 8-1/2 in. x 11 in., to be mounted in the filter room, that reads:

    WARNING
    Prior to emptying Pool
    Consult O & M Manuals for Procedures

    Add another sign shall read:

    Keep all Caps, Plugs and Tops Tight Fitting to Prevent Escape of Fumes.

14. One set of applicable submittals shall be included in each manual.

C. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered, or which may be required by the CONTRACTOR.

D. Manuals and other data shall be printed on heavy, first quality paper, 8-1/2 x 11 inch size with standard 3-hole punching and inserted in plastic covers. Drawings and diagrams shall be reduced to 8-1/2 x 11 inches or 11 x 17 inches. Where reduction is not practical, larger drawings shall be folded separately and placed in envelopes that are bound into the manuals. Each envelope shall bear suitable identification on the outside.

E. Six (6) bound volumes of each manual shall be submitted. All parts lists and information shall be assembled in substantial manuals and permanent, three-ring or three-post binders. Material shall be assembled and bound in the same order as specified, and each volume shall have a table of contents and suitable index tabs.

F. All material shall be marked with project identification. Non-applicable information shall be marked out or deleted.

G. Shipment of equipment will not be considered complete until all required manuals and data have been received.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.

B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

C. Handle materials in a manner to prevent damage.

D. Store all materials on clean raised platforms with weather protective coverings. Provide continuous protection of materials against damage or deterioration.

E. Remove damaged materials from site.

1.11 WARRANTIES

A. The CONTRACTOR warrants to the Owner and Architect that materials and equipment provided under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted, and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements, including substitutions not properly approved and authorized will be considered defective. The CONTRACTOR'S warranty will exclude remedies for damage or defect caused by abuse, improper or insufficient maintenance, improper operations, modifications not executed by the CONTRACTOR or improper wear and tear under normal use. If required by the Architect, the CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of one year from the date of substantial completion or the owner begins using the pool unless otherwise specified.

B. The CONTRACTOR shall agree to repair or replace any defective or non-complying work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

C. Submit all warranties covering, but not limited to the following:

1. All pool deck equipment and accessories against defects in material, manufacturer and installation for a period of one (1) year.

2. Defects in material, manufacture or installation of the recirculating overflow system and interior coating of the trench for a period of one (1) year.

3. Defects in material, manufacture and installation of the filtration, backwash, chlorination, pH adjustments and cleaning systems, including controls for a period of one (1) year.

4. Defects in material or workmanship of the pool structure causing a loss of water for a period of three (3) years.

5. Defects in material, workmanship, and installation of the pool piping system for a period of three (3) years.

6. Defects in material, workmanship, and installation of the pool pumps for a period of one (1) year.

7. Manufacturer's minimum five (5) year warranty against defective materials, components and workmanship in the pool chemical controller. ORP, pH, flow and temperature sensors shall be covered by a standard two (2) year warranty. All other sensors and flow cell components shall be covered by a standard one (1) year warranty.

8. Manufacturer's minimum eighteen (18) month warranty against defective materials, components and workmanship in the Variable Frequency Drive system effective the date of supply

9. Defects in material, workmanship, and installation of the pool cementitious finish against cracking and delamination for a period of three (3) years.

10. Defects in material, workmanship, and installation of the pool painted finish against delamination for a period of one (1) year.

11. Defects in material, workmanship, and installation of the tile finish against cracking and delamination for a period of five (5) years.

12. Manufacturer's minimum fifteen (15) year warranty on the filter tank against defective materials or workmanship of the tank and components. (Additional warranty time may be purchased from the manufacturer.) Prorated warranties are not acceptable.

13. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the sanitizing feed system.

14. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the pH buffer feed system.

15. Manufacturer's minimum three (3) year warranty against defective materials, components and workmanship in the movable bulkhead. The entire bulkhead shall be guaranteed against delamination or structural defect for a period of twenty-five (25) years.

16. Manufacturer's minimum three (3) year warranty against defective materials, components and workmanship in the pool compressed air bubbling system - sparger.

17. Manufacturer's minimum fifteen (15) year systems warranty against defective materials, components and workmanship in the pool tile setting materials.

18. Manufacturer's minimum five (5) year warranty on the complete heat exchanger assembly.

19. Manufacturer's minimum one (1) year warranty against defective materials, components and workmanship in the ultraviolet sanitizing system (excluding the UV arc tube). UV arc tubes are warranted to operate for 4000 hours when operated continuously. A continuously operated UV arc tube that fails prior to 4000 hours of operation shall be replaced free of charge. Intermittently operated UV arc tubes (>1 on/off cycle per day) will be replaced free of charge if failure occur prior to 2000 hours and prorated between 2000 and 4000 hours.

1.12 SYSTEM TRAINING

A. A qualified representative of the CONTRACTOR performing work under this section shall put the equipment into operation and instruct the Owner's representatives in the operation of this equipment to the Owner's satisfaction immediately after project’s substantial completion.

B. The CONTRACTOR’S training representative shall have completed the equipment/system’s manufacturer’s training requirements and be certified, by the manufacturer, to provide and teach system training.

C. The representative from the CONTRACTOR shall be either a CPO (Certified Pool Operator) or have an AFO (Aquatic Facility Operator) certification.

D. Training periods shall consist of 32 hours of on-site training and scheduled as follows:

1. 16 hours of initial training on the complete swimming pool system. The 16 hours of initial training is to be comprised of at least 4 hours of training on water chemistry analysis and adjustment. The water chemistry training will include in depth review of the use of the Langlier index and its computation.

2. The initial 16 hours of training shall include information on the care, operation, adjustment, and maintenance of all items provided by the CONTRACTOR under the "Part 2 – Products" section of this specification.

3. 16 hours of training after the Owner's staff has had experience operating the system. This time may be requested any time after the pool has been placed in operation within a period of one (1) year from the time the pool was accepted by the Owner. The additional training shall contain at least 2 hours of review of water chemistry.

4. The CONTRACTOR shall provide a project specific video recording instruction manual in addition to the training sessions. The video instructions shall be project specific and shall include information on the care, operation, adjustment, and maintenance of all items provided by the CONTRACTOR under the "Part 2 – Products" section of this specification. This video recording shall be done separate from the Owner training.

5. The CONTRACTOR shall include one (1) copy of all video recording instructions in each Operations and Maintenance Manual.

1.13 POOL FILL WATER QUALITY

A. The Owner shall bear the cost of the water required for two (2) complete fillings of the pool (the initial water tightness test and the final filling). Removal of iron or copper (if in excess of .3 ppm) will be required for the final fill to avoid staining of the pool finish. Any subsequent fillings or partial fillings (more than 25%) of the pool shall be by the CONTRACTOR, at its own expense.

B. The CONTRACTOR shall provide the necessary plant equipment so that the temperature of fill water will be within plus or minus 10 degrees of the ambient air and/or the pool structure at the time of filling. Extreme caution is urged if the temperature variance is greater than 10 degree F.

C. The CONTRACTOR shall provide the necessary chemicals and to adjust and balance the water chemistry in the pools to the following levels:

pH	7.4 - 7.6
Calcium Hardness	200 - 400 PPM
Total Alkalinity (Calcium Hypochlorite)	60 - 80 PPM
Langelier saturation index	-0.3 - +0.3
Total Dissolved Solids (TDS)	not to exceed 1,500 PPM

1.14 START-UP CHEMICALS

A. The CONTRACTOR shall maintain the chemical balance of the pool water (including the cost of all chemicals required) until the pool and mechanical system(s) are fully operational and accepted by the Architect and the Owner.

B. Provide the Owner with sufficient quantities of the necessary chemicals to maintain the pool operation for a minimum of thirty (30) days from substantial completion or the owner begins using the pool.

C. Chemicals to be provided to the Owner shall include those required by the chemical feed systems installed.

1.15 RECORD DRAWINGS

A. Provide a complete set of record drawings of the entire pool system(s) including all sub-systems. All record drawings shall be prepared in accordance with the requirements of Section 017839 and shall be a complete, stand-alone set. The CONTRACTOR shall be permitted to obtain original documents and copy them for this purpose only. Provide the record set on compact disk (AutoCAD Release 2010 or compatible software).

PART 2 - PRODUCTS

2.1 OVERFLOW SYSTEM

A. It is the intent of the specifications that the perimeter overflow system and surface cleaning be maintained under all conditions of normal operation and that no water be discharged to waste except when cleaning the filters or emptying the pool.

B. Concrete Perimeter Overflow System

1. A perimeter overflow system consisting of a continuous concrete and tile overflow channel as detailed and shown on the drawings shall be installed on the pool(s). The bottom of the trough shall be level throughout.

2. The complete gutter trough interior, including the underside of the parapet, shall be coated with epoxy paint. Refer to section 2.16. Areas not meeting the manufacturer's recommended thickness will be recoated without additional cost to the Owner.

3. All grating corner installations shall be prefabricated thermo-welded corner sections provided by the grating manufacturer and installed with adequate support per manufacturer recommendations. Butting grating sections together at corners shall not be permitted.

4. The grating shall be formed of molded PVC sections. Modular, interlocking pieces of UV stabilized PVC grating. The top surface shall have a raised, diamond ridge design to create good friction, wet or dry and be 11/16” wide with an outside depth of 1.0” and a middle depth of 1-3/8” for extra strength. The space between pieces shall not exceed 3/8”. Each piece of grate shall have a slotted hole at the ends for insertion of a stainless steel fastener clip and anchor screws every 5 feet and shall be easily removable. Grating surface bars shall run parallel to the pool wall and with the gap, provide at least 35% open space per foot for unrestricted water flow. The color of the grate shall be selected by the Architect. The width of the grating shall allow the insertion of the touchpad holding brackets between the grating and the gutter lip.

   a. Basis of Design: Grating shall be manufactured by Lawson Aquatics supplied by Neptune-Benson, Daldorado, or approved equal.

5. Contractor’s Voluntary Alternate Option – NATARE GPM GRATING: Grating shall be a high density stabilized polymer grating. The grating openings shall run parallel/perpendicular to the pool wall. The open area of the grating shall be no less than 35%. Bracing shall be provided in the gutter trough between grating sections to prevent deflection. The grating shall be machined from a solid block of material; no fasteners, adhesives, joining or other assembly methods shall be used to fabricate or assemble the grating sections. The grating shall be colorfast and easy to clean with a permanent slip-resistant surface, providing no greater than .315-inch (8-mm) opening and shall have a minimum cross-sectional thickness of 1-in. (25.4-mm). The grating must be guaranteed not to crack, flake, separate, rot, swell, splinter, discolor or delaminate, regardless of pool water chemistry. Repeated blows from a heavy hammer shall not cause the grating to crack, chip or shatter. Grating shall be made entirely from FDA and USDA approved materials. Grating color shall be white. Provide a ten (10) year warranty for workmanship and performance with a fifteen (15) year warranty against cracking or breaking. The top surface of the grating shall be a permanent bi-directional slip-resistant surface consisting of integrally machined groves and shall have cross groves running perpendicular. The grating shall be certified as slip-resistant, non-hazardous walk surface under ASTM 1028 C and shall have the capacity to sustain a uniform load of 100 pounds per square foot.

a. Basis of Design: Grating shall be manufactured by Natare Corporation, or approved equal.

6. All materials, anchors and fasteners shall be 316L stainless steel.

2.2 PUMPING EQUIPMENT

A. Any proposed substitutions shall include a mechanical drawing incorporating all required changes in layout, piping and valves. The cost of such changes shall be included in the price of the substitute. CONTRACTOR to confirm voltage prior to ordering pump. All motors shall be capable of continuously running without overloading at any point on the characteristic curve of the pump without overload or harm. CONTRACTOR shall confirm by 1/4 inch scale shop drawing that the pumps and filters to be provided will fit in the available space and can be removed for servicing.

1. Pumps shall be certified by the National Sanitation Foundation (NSF) and bear the certification mark.

2. Pump casing shall be cast iron fitted with a replaceable bronze case wear ring. Mechanical seals shall be provided specific for a clear, mildly chlorinated water application. Pump impeller shall be enclosed type of cast bronze, statically and dynamically balanced, and trimmed for the specified design conditions. If a VFD is to be used in conjunction with a pump, the impellor shall be trimmed to the maximum diameter based on the rated motor horse power. All bronze materials shall be suitable for use in a chlorinated environment. Suction and discharge flanges shall be provided and tapped for gauge connections. Provide steel or cast iron bases.

3. If the pump is powered with a VFD, the impeller to be trimmed to a maximum diameter based on the most limiting condition of either the diameter of the maximum non-overloading rated motor horse power at the design point or a diameter resulting in 10% greater head than the specified head.

4. Pump motor shall be totally enclosed, fan cooled (TEFC) and premium efficiency of the horsepower and speed specified. A pump requiring larger horsepower shall not be acceptable.

5. Provide a hair and lint strainer, for each pump, of fiberglass or epoxy coated stainless steel construction with a clear observation top in the sizes (or pipe sizes) indicated on the drawings. Verify and coordinate pipe and pump suction sizes in the field. Strainer to be of a low pressure drop full-open or a tapered eccentric reducing type. Straight reducing type strainers will not be acceptable without the addition of an approved tapered eccentric reducer between the strainer and the pump (in which case, sufficient space in the pump pit must be verified). Provide a stainless steel basket with at least 4 times the free open area as the inlet pipe, and one spare basket with each strainer.

a. Basis of Design: As manufactured by MerMade Filter Inc., or Neptune/Benson Inc., or Fluidtrol Process Technologies, Inc.

6. Provide a fusion-bonded epoxy coating on all wetted parts to protect pump internals from corrosion, including pump volute interior and complete pump impeller. Sandblast to bare, white metal. Thickness shall be 8 to 12 mils (heavy film). Verify thickness by non-destructive testing. Coat parts as recommended by manufacturer, including preheating parts to 400 degrees and electrostatic deposition or fluidized bed technique. Provide primers if required to resist chlorinated water <10 ppm. Coating shall be Scotchkote 134 manufactured by Fusecote or approved equal.

7. Entire pumping unit shall be mounted on a base using cap screws to preserve the back pull-out feature of the pump. Pumps shall not be secured with floor studs. The pump base shall be coated with the same epoxy coating as the pump. An OSHA approved guard shall protect coupling and exposed rotating components of the pump and motor where required.

8. Recirculating Pumps and Motors

a. Competition Pool (PP1 & PP2)

1) Provide two (2) horizontally mounted centrifugal pump, as shown on the drawings and described in these specifications. Each pump is to be of a straight centrifugal, end suction, bronze fitted,

close coupled type, capable of pumping 1,150 GPM against 78 ft. TDH with an efficiency of no less than 80% and a required net positive suction head (NPSHr) no greater than 10 ft. It shall be provided with a 30 HP, 1780 RPM, 460 VAC, 3 phase, 60 cycle electrically driven motor meeting these specifications.

a) Basis of Design: The system design is based upon Paco. Pumps manufactured by Paco, ITT Marlow, Griswold, or Aurora shall all be considered, provided they meet the requirements.

b. Dive Pool (PP3 & PP4)

1) Provide two (2) horizontally mounted centrifugal pump, as shown on the drawings and described in these specifications. Each pump is to be of a straight centrifugal, end suction, bronze fitted, close coupled type, capable of pumping 1,000 GPM against 82 ft. TDH with an efficiency of no less than 80% and a required net positive suction head (NPSHr) no greater than 10 ft. It shall be provided with a 30 HP, 1760 RPM, 460 VAC, 3 phase, 60 cycle electrically driven motor meeting these specifications.

a) Basis of Design: The system design is based upon Paco. Pumps manufactured by Paco, ITT Marlow, Griswold, or Aurora shall all be considered, provided they meet the requirements.

c. All recirculation pumps shall be provided by the same manufacturer. Confirm voltages prior to ordering pumps.

d. Endless Pool (PP6) (Alternate #2)

1) Provide one (1) self-priming pump for Endless Pool recirculation as shown on the drawings. The pump shall be 2 HP, 3450 RPM, 230 VAC, 60 Hz, 3200 Watts Maximum, 1 phase, 60 cycle unit capable of 28 GPM at 70 ft. TDH.

2) Basis of Design: Pump to be a Pentair Intelliflo i1 or approved equal.

9. Feature Pumps and Motors

a. Agitator Pump (PP5)

1) Provide one (1) self-priming pump for water surface agitation and pool draining as shown on the drawings. The pump shall be 3 HP, 3450 RPM, 230 VAC, 60 Hz, 3200 Watts Maximum, 1 phase, 60 cycle unit capable of 120 GPM at 80 ft. TDH.

2) Basis of Design: Pump to be a Pentair Intelliflo i1 or approved equal.

3) Provide with remote start/stop function for on/off operation from control office. Coordinate conduit routing with electrical.

b. Hydrotherapy Pump - Endless Pool (PP7) (Alternate #2)

1) Provide one (1) self-priming pump for hydrotherapy water jets as shown on the drawings. The pump shall be 1/2 HP, 3450 RPM, 230 VAC, 60 Hz, 3200 Watts Maximum, 1 phase, 60 cycle unit capable of 32 GPM at 45ft. TDH.

2) Basis of Design: Pump to be a Pentair Whisperflo or approved equal.

10. Other System Pumps and Motors

a. Provide one (1) portable utility pump(s). The pump(s) shall be a 1 HP, 3600 RPM, 230 volt, 1 phase, 60 cycle unit capable of 60 GPM at 25 ft. TDH.

1) Basis of Design: Pump to be a Godwin GSP10 or approved equal.

B. Variable Frequency Drive Starters

1. Provide VFD starters for all pool pumps. VFDs shall be a product of H2Flow Controls, Pentair AcuDrive, Neptune Benson, or approved equal.

   a. Basis of Design: Eco-Flo-C by H2 Flow Controls.

2. It is the contractor's responsibility to ensure that all equipment is provided with the correct operating voltage and that all interconnected electrical and electronic equipment shall adequately communicate and operate the specified pumping equipment. All equipment installations shall meet or exceed the requirements of the National Electric Code and all other local and state regulations.

3. Specified equipment in this section shall be mounted in accordance with manufacturer's requirements and in a suitable location where indicated on the plans or approved by the Architect/Engineer. All electronic equipment installed where a corrosive atmosphere may exist shall be enclosed in NEMA 4 stainless steel or NEMA 4X nonmetallic enclosures. In other locations NEMA 12 enclosures are acceptable. The programmable and display features of all electronic equipment shall be accomplished via NEMA 4X enclosed key pads and operator backlit LCD Graphical/Alpha/Numerical Displays. VFD's installed within a supplementary panel shall not be vented or cooled from ambient external air. With the exception of the VFD's heatsink and water-resistant heatsink fan, the VFD's electronics shall be fully sealed within the NEMA 12 or higher enclosure. So called 'NEMA 12 or NEMA 4 Vented' enclosures are not permitted.

4. The VFD shall convert incoming fixed frequency three phase AC power into a variable voltage and variable frequency three phase output utilizing pulse width modulation. Advanced Space Vector Control will be utilized to reduce motor heating and provide precise control of the AC motor.

5. The VFD shall be capable of adjusting the pump motor speed based upon specific flow requirements. A 4-20 milliamp output signal from a Programmable Aquatic Controller, PLC, electronic flow meter transmitter or other electronic device shall supply the required flow information to the VFD to regulate motor speed. The VFD shall be capable of interfacing to this analog output signal be commissioned to achieve a 'constant flow' condition. The VFD shall also be provided with a manually operated potentiometer to adjust the pump speed in the case of an electronic communication failure.

6. Electronic equipment shall be supplied with a phase rotational check capability. The contractor shall also be required to assure that a phase rotational check is accomplished with the bypass switch, herein specified, in the across the line position to assure correct rotation when connected to all motor power sources.

7. The VFD shall include a built-in Line Filter to mitigate harmonic distortions being transmitted back through the supply lines.

8. The VFD shall utilize DC link reactors to filter out bus ripple and provide smooth DC power to the transistor section.

9. The VFD shall utilize IGBT transistors to produce a pulse width modulated output. SCR output stages are not acceptable.

10. The VFD shall have a full load amp rating which exceeds or meets NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, and shall be able to provide 110% of its variable torque rating and 150% of its constant torque rating for one minute.

11. The VFD shall utilize space vector control to reduce motor harmonics and torque ripple.

12. The VFD shall include the ability to reliably protect the pump from any of the following abnormal pump conditions: Run Dry/Loss of Prime; Cavitation; Dead head/Closed Valve; Worn impeller; Blocked Filter; Bearing Failure/Wear Detection. Protection using measured current (Amps), as a method for these protective features shall not be acceptable.

13. The VFD shall provide a display with selectable readout of parameters, including: Speed; Torque; Electrical Power; Current; Output Voltage; Frequency; Heatsink Temperature; Motor Temperature; Run Time; Energy Consumed; Mains Time.

14. The VFD shall include the capability for copying of settings when multiple similar pumps are involved. Settings established in one VFD shall be transferred to the others via a removable keypad.

15. All VFDs shall be provided with a bypass function to allow for pump motor operation by bypassing the variable frequency drive. Bypass mechanism may be internal to the VFD cabinet or provided in a separate enclosure with NEMA rating equivalent to the specified drive enclosure. NEMA 12 'vented' panels are not acceptable. The bypass shall be UL listed as a motor disconnect device.

16. Three Motor Contactors shall be included. Contactor A is required to be in series with the Line Power supply and the VFD, Contactor C is required to be in series with the VFD and the motor and Contactor B is required to bypass the VFD. In 'VFD' operation, contactors A and C are engaged and contactor B is open. When in 'Bypass' mode, contactors A and C are open and contactor B is engaged.

    a. All contactors shall be appropriately rated for the supply voltage and pump motor specified and shall be in accordance with NEC standards.

    b. Contactor B shall include an appropriately rated Motor Overload.

    c. Resettable pump motor overload protection shall be provided for both the VFD and across the line sources of power to all motors.

17. A Control Power Transformer shall be included so as to provide the necessary control voltage required to operate the Motor Contactors. The VFD panel or separate Bypass panel, shall include a door mounted 3-position lockable selector switch. The switch shall be labeled: VFD-OFF-BYPASS. The switch is to require a key to move from one position to another. Two keys shall be provided to the customer. The Bypass panel shall be manufactured in accordance with and approved to UL508.

18. All applications shall require the inclusion of an appropriately rated Line Reactor to reduce harmonic distortion. The Line Reactor shall be housed in an enclosure according to the manufacturer's instructions, taking careful note of the device radiated heat and the chemical environment in which it may be installed. Pentair Acu-Drive includes as standard a built in DC Link Reactor (equivalent to 5% Line Reactor). Where this is insufficient, a separate larger Line Reactor shall be provided.

19. All applications that will have a cable length between the VFD and the Pump Motor which exceeds 300 feet shall require the inclusion of an appropriately rated Motor Protection Filter (dV/dt filter). When included, the Motor Protection Filter shall be housed in an enclosure according to the manufacturer's instructions, taking careful note of the device radiated heat and the chemical environment in which it may be installed.

20. The VFD shall include additional contacts for interface with a remote start/stop panel and/or emergency stop function. When the VFD is supplied for a spa hydrotherapy pump, the drive shall also interface with a remote timer switch to control pump operation via a preset timed duration (15 minute timer switch).

21. Installations in locations where a Power Disconnect is not within 'line of sight' of the VFD Control Panel, or where deemed necessary by local electrical codes, shall require the installer to provide a suitably rated Circuit Breaker Disconnect.

22. The VFD shall be UL listed to accept a supply voltage of -15% / + 10% of its stated supply rating.

23. The VFD shall be electronically lockable in order to prevent unauthorized or unintended program changes.

24. Motors to which the VFD is to be installed shall have a minimum insulation of "Class F".

25. Parallel operation of recirculation pumps: When specified in the project's scope, the VFD will be required to operate two identically sized pumps simultaneously. In this configuration, the VFD must be rated to simultaneously operate all pumps at full load. Bypass Control must be included. Bypass Control must include an Overload Relay for each pump motor and the Overloads must be configured in such a way as to protect their respective motor when in either VFD control or Bypass control. Under no circumstances should the VFD's motor overload protection be used to protect multiple motors. If 'constant flow' via analog flow transducer signal is enabled for multiple pumps, it must be disabled when one of the pumps is taken out of service.

26. User Interface for initial programming and day to day operation.

    a. The VFD shall include a programmable Controller with an operator backlit LCD Graphical / Alpha / Numerical Display. The Controller shall comprise the following features:

    b. Real Time Clock

    c. Password protection

    d. Hard-wired tamper protection feature

    e. Custom software to control the VFD via a Modbus communication network.

    f. Automatic Flow Control. The Controller and VFD are to automatically adjust the pump's speed in order to compensate for a filter becoming dirty. The system is to maintain a minimum flow (GPM) required to meet State mandated turnover rates.

    g. Programmable speeds for daytime and nighttime turnover rates.

    h. Non-volatile memory. All programmed parameters as well as the real time clock settings shall be maintained in the event of a power outage.

    i. The Controller shall be capable of interfacing to an analog output signal from a Flow Transducer and displaying measured flow in GPM

    j. Automatic reset of alarms caused by power brown outs/power loss

    k. External input for seasonal/unoccupied speed

27. Equipment specified in this section shall be programmed and tested under power after connection to the required motor by a factory trained technician. All low voltage control wiring connections to the respective pool systems shall be provided by the Swimming Pool Contractor. Line voltage and/or high voltage connections and interlocks shall be provided by the Electrical Contractor.

C. Pump Gauges

1. Pressure gauges shall be installed on the discharge of the pumps.

2. Compound gauges shall be provided at the intake port of the pumps, after the hair and lint strainer.

3. Gauges shall be liquid filled, 316L stainless steel bourdon tube type with a minimum 2-1/2 inch diameter dial, high impact polypropylene or stainless steel case, corrosion resistant white scale with black divisions and numerals, 300 Series stainless steel heavy duty rotary bushed movement, , black enameled balanced Micrometer pointer.

    a. Basis of Design: Gauges shall be as manufactured by Weksler Instrument Corporation or approved equal.

4. Scale ranges shall be selected to indicate the normal system operating pressure of each system or location within the system. Pressure ranges shall be calibrated in psig (0-60 psi) and compound gauge shall be calibrated in inches of mercury (0-30 in Hg / 0-60 psi).

5. A stainless steel filter type pressure snubber shall be provided for each pressure gauge installed consisting of a 3/8 inch diameter by 1/8 inch thick micro metallic stainless steel filter and placed in the line just before the pressure gauge. Provide isolation brass valves or brass gauge cocks at each gauge for easy replacement and maintenance.

D. Provide link seals for all pipe penetrations as indicated on the drawings. Locations will include the pump pit and foundation wall penetrations *(if expansive soils are present)* and other locations as noted. Link seals shall be provided in the sizes and quantities shown on the drawings and installed to provide a flexible watertight penetration. Metal parts shall be made of 316L stainless steel. Links shall form a continuous rubber seal that is tightened with a series of stainless steel bolts to form a watertight seal. Link seals shall be manufactured by Thunderline Corporation, Calpico Inc. or approved equal. Xypex Patch'n Plug or approved equal shall be used to seal pipe penetration. The CONTRACTOR is to provide factory plastic wall sleeves of the appropriate sizes designed for the specific application and seal size and type. Each sleeve is to have an integrated water stop.

2.3 FILTRATION EQUIPMENT

A. The filter system shall consist of high rate pressure sand filter tanks as shown on the drawings. Every aspect and component of the filter system must be certified by the National Sanitation Foundation (NSF) and bear the certification mark. The filter must have an engraved metal data plate permanently affixed on the face of the system that describes operational data and instructions and indicates start up date.

B. It is the intent of these specifications to describe a filtration system complete in every respect with all accessory items and supplied and warranted by one manufacturer.

C. Horizontally Oriented Fiberglass Tanks

1. The filter tanks shall be horizontally oriented single cell fiberglass tanks, minimum 60 inches in diameter. The filter system must be listed as approved by National Sanitation Foundation prior to bid date.

   a. Basis of Design: Fiberglass filters shall be the product of Paragon Aquatics / Stark, Waterco, or Neptune Benson provided they meet the specifications and layout. System design based upon Neptune Benson. Valves must be provided to backwash one filter at a time.

2. Filter tanks must incorporate all components and feature as described in this section.

3. Two (2) saddle style bases shall be provided for tank support. Systems that incorporate stacked tanks shall include similar bases and mounting saddles for the upper vessel. Tank supports and connections shall be seismic rated to support the filter tank(s) for the appropriate seismic zone where the project is located. Access to the tank shall be provided by a 14" x 18" manhole with two (2) curved yokes. Manhole seal shall be complete with a one piece 1/4" neoprene gasket and positioned so that internal pressure from the filter will augment the seal. No additional hardware or through bolts will be allowed.

4. Each filter tank shall be equipped with the necessary flanges and connections for the internal and external piping. Connections shall be comprised of fiberglass flanges and schedule 80 PVC flanges.

5. All tank connections 2 inches and smaller shall be 150 lb. Type 316L stainless steel threaded full couplings. All tank connections 3 inches and larger shall be heavy steel bosses drilled and tapped both sides to receive standard flanged fittings or Sch. 40 Type 316L stainless steel nipples.

6. The discharge from the automatic air release valve shall be hard piped to waste. Each filter tank shall have a means of releasing air. Each coupling or orifice is to be provided with a slotted PVC sand retainer or stainless steel strainer. An automatic air release system shall be provided for each tank.

7. The drain system shall consist of a 3/4 inch 316L stainless steel coupling mounted at the lowest point in the bottom head. This drain shall be valved and piped to the nearest floor drain or backwash pit.

D. Filter Piping - Internal

1. The lower internal distribution system shall be a horizontal header/lateral arrangement. The header shall be Schedule 80 PVC construction, capped on one end and flanged or threaded at the other end for field connection. Lateral connections shall be spaced no more than 6 inches on centers, and shall be 1-1/2 inch FPT connections. All attachments to header shall be solvent welded and thermo-welded to insure integrity of connection.

2. Under drain system shall be factory installed and constructed of extra heavy Schedule 80 high impact PVC. Multiple PVC main headers to be tapped and threaded to receive laterals.

3. Laterals shall consist of 1-1/2 inch Schedule 80 PVC pipe with openings as required. Each lateral shall be fabricated complete with socket cap on one end and male adapter on the other end. Both fittings to be solvent welded to the slotted pipe. Laterals shall be designed and sized at the factory so as to be installed in the field and over the entire cross sections area of the filter.

4. The upper distributor shall consist of PVC piping Schedule 80 and/or deflector plate per manufacturer standard design.

5. Each filter shall be supplied with a pressure equalizing upper internal distribution system consisting of a horizontal header/lateral arrangement. The header piping shall be constructed of Schedule 80 PVC. The header/lateral piping and all connections shall be designed and sized to provide uniform distribution and unrestricted flow during the filtration and backwash cycles.

6. Upper laterals shall be constructed of Schedule 80 PVC pipe with machine slotted openings or orifices. All machined slots or orifices shall be clean, de-burred and free of any obstructions that would not permit the free flow of water through the opening. Details of the lateral attachment to the header shall be submitted for review and approval.

7. The lower and upper distribution systems shall be properly supported and anchored. All hardware in wetted areas shall be Type 316L stainless steel or non-metallic. Tank interiors must be inspected prior to the media being placed in the filters.

E. Filter Piping - External (Face)

1. External face piping shall be Schedule 80 PVC pipe and fittings. Flanges shall be located so as to allow for easy dismantling of face piping. All fittings shall be solvent cemented.

2. Piping shall be drilled and tapped where necessary to accommodate gauge tubing connectors.

3. All valves 3" and larger shall be constructed with cast aluminum S12A alloy (as defined by ASTM B275) housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and 316L stainless steel shaft. Valves shall be rated for 150 psi bubble tight shutoff. Unless otherwise specified, all nuts and bolts shall be stainless steel with stainless steel washers to be used when secured to PVC flanges. Systems incorporating solenoid, pneumatic, pressure amplified, hydraulic or multi-directional valves shall not be acceptable.

4. Standard accessory items shall include sight glass rated for 50 psi with polycarbonate glass, remote mounted gauge panel with two 4½" diameter pressure gauges, ¼" petcocks, ¼" poly vent tubing with PVC compression adapters.

F. Backwash Control

1. The filter manifold face piping shall be designed to allow for one (1) filter tank to be backwashed at a time while the recirculation system is operating. A manual backwashing system shall be provided with the filter system.

2. Manual Backwash System

   a. The manual backwash system shall be equipped with a face piping configuration such that the operator shall be manually control and operator both the time and sequencing of the backwash cycle. Valving on the filter face piping shall be a mechanical linkage device allowing the operator to simultaneously move two (2) valves at once. All mechanical linkage components shall be PVC or Type 316L Stainless Steel.

G. Automatic Air Relief Valve

1. A 1" valve shall be provided to automatically and continuously release air in the filter. The valve shall be fabricated of plastic with Buna-N seals. A plumbing kit shall be provided with two (2) PVC ball valves to allow manual air relief and isolation of the automatic valve. Valves fabricated of cast iron, bronze or stainless steel valves will not be accepted.

H. Filter Media

1. Filter media shall be a carefully selected grade of hard uniformly graded silica material. Media shall be milled angular shaped particles of silica quartz. The filter sand shall have a particle size between 0.45 mm and 0.55 mm and have a uniformity coefficient not to exceed 1.53. Specific gravity shall not be less than 2.5 with a pH of 7.0.

2. All media (sand) shall be cleaned and free from any clay or limestone deposits. Bottom layer of support media shall be placed by hand to avoid damage to the under drain system and leveled before the addition of the upper layer of filter media.

3. All media shall be delivered after approval by the manufacturer of the filter and stored in 100 pound bags for ease of handling and elimination of possible contamination.

4. Media to be supplied by the filter manufacturer and approved by the filter manufacturer prior to shipping.

I. Filter Size

1. Filters have been sized based on a maximum allowable filtration rate of 13.0 GPM/SF:

	Units	Competition Pool	Dive Pool	Endless Pool (Alternate #2)
Volume	Gallons	697,393	596,346	3,028
Flow Rate	GPM	2,300	2,000	28
Filter Model		(4) SHFFG 60-84	(4) SHFFG 60-72	Waterway PCCF-075
Filter Size	Sq. Ft.	176.9	153.8	75
Turnover Rate	Hours	5.05	4.97	1.8
Filtration Rate	GPM/Sq.Ft.	12.55	12.25	0.37

2.4 RECIRCULATION FITTINGS

A. Main outlets (main drains) shall be concrete sumps with 12 gauge PVC frame and PVC grating/ PVC or prefabricated fiberglass sumps with integral frame and PVC grating and sized as shown on the plan. Grate openings shall not exceed 11/32 inch in width, providing an open flow area to allow water velocity not to exceed 1.0 fps. The grate shall be PVC and fit closely and flush with top surface of frame and secured to frame with vandal proof fasteners. All exposed edges of main outlets shall be rounded and

smooth, free of burrs and sharp edges. All main drain covers shall comply with the Virginia Graeme Baker Act and ANSI/APSP-16 2011.

B. Provide hydrostatic relief valves consisting of a 2" cycolac relief valve connected to a FPT commercial style Schedule 80 PVC collector tube. The collection tube shall have seepage holes, 3/8 inch in diameter, and shall be screwed securely to the valve body. The hydrostatic relief valve shall be designed to seal with minimum pressure and shall have a non-plugging, self-cleaning raised valve seat. Hydrostatic relief valve to be Hayward Number SP1056 with collector tube model Hayward Number SP1055, or approved equal.

C. Concrete drop out boxes (converters) shall be concrete sumps with 12 gauge 316L stainless steel frame and PVC grating and sized as shown on the plans. Grate openings shall not exceed 11/32 inch in width, providing an open flow area to allow water velocity not to exceed 1.0 fps. The grate shall be PVC and fit closely and flush with top surface of frame, and secured to frame with vandal proof fasteners. Provide no-leak seal flange at the midpoint of the boxes.

D. Adjustable floor inlet fittings shall be Lawson Aquatics MLD-FW-02-WT, or Hayward SP-1425 floor return fitting with adjustable flow orifice, or approved equal with equivalent flow capacity. Color shall be black for all inlets located in tile lane markings.

E. Sight sump frame(s) and cover(s) shall be size appropriately to provide access to the vertical sight sump standpipe as indicated in the plans. Frame and cover shall be 15" x 17" CDR style Quazite polymer concrete enclosure model number B10151712G, with cover model number C10151702A. Cover shall be provided with stainless steel vandal-resistant fasteners. Quazite cover color shall be selected by Architect – standard color is concrete grey.

F. Valve box covers and frames that are not specified on the drawings or specifically identified as another size or material shall be Zurn model #ZANB-1461-12-VP, nickel bronze with polished scored top, vandal proof screws or approved equal.

G. Water surface agitators shall be as detailed on the plans and connected to the PP5 pump discharge piping. Construction shall be machined or cast bronze/brass. Face plates shall be removable for alignment or cleaning by using security key part #WMF082. The water inlet connection shall be 1". The unit shall be the Stream Jet (WMD105) for deck level (horizontal surface) mount, by Crystal Fountains (905) 660-6674.

H. Anti-vortex plates shall be provided at the suction points of the main recirculation pump(s) and the agitator/drain down pump in the surge tank(s). Each plate shall be connected to the suction pipe via a PVC flange and shall be ½ in. thick with minimum dimension of at least 2.5 times the connecting pipe diameter. The plate shall be located 4 inches above the finished floor of the surge tank. Four (4) 3/4 in. stainless steel threaded rods, nuts, anchor bolts and washers shall be used to fix the offset distance and provide a secure base for the suction pipe. Manufactured fiberglass or PVC anti-vortex plates by Daldorado, Neptune-Benson, or approved equal, shall also be acceptable.

2.5 PIPING SYSTEMS

A. General

1. Provide all recirculating piping between the pool(s) and the filter room, fill receptor and all interconnecting piping to and from the chemical feed systems and chemical controller.

2. Provide all necessary pipe supports and support systems required to support all associated piping and valves.

3. Provide all other tubing, conduit, or piping associated with equipment specified herein. Coordinate with other trades.

B. Pipes

1. Pipe routing as shown and detailed on the contract drawings is diagrammatic only and is not intended to show minor details or exact locations of piping systems. Installation is required to be adjusted to accommodate interference and adjustments anticipated and encountered. Pipe sizes on plans refer to nominal inside diameter of the pipe.

2. All PVC swimming pool piping shall be NSF approved and conform to the requirements of ASTM D-1785.

3. All PVC pipes shall be the product of one manufacturer. Approved manufacturers of PVC piping are Eslon, Harvel, and Chemtrol or approved equal.

4. Swimming pool piping above the floor or deck in the filter room shall be Schedule 80 PVC.

5. Swimming pool piping below the filter room floor or deck shall be NSF approved, Schedule 80 PVC.

6. All swimming pool piping under the pool floor shall be NSF approved, Schedule 40 PVC and concrete encased. All transitions between Schedule 40 and Schedule 80 shall be encased in concrete.

7. All below grade swimming pool piping not located beneath the pool floor can be backfilled with native granular material free of ice, clay, debris, organic matter, and rocks larger than 4" across their greatest dimension, and per recommendations indicated in the project geotechnical report.

8. The influent and effluent lines to the heat exchanger unit shall be CPVC. Connections between metallic piping and/or equipment and PVC shall be flanged.

9. All PVC and CPVC fittings shall be the product of one manufacturer. Molded fittings shall be as manufactured by Asahi, Eslon, Chemtrol, Harvel, Spear, Lasco or acceptable substitute. Fabricated fittings shall be as manufactured by Harrison Machine, Plastinetics, or acceptable substitute.

10. Vertical sight sump piping shall be NSF approved, Schedule 40 PVC. Horizontal sight sump piping shall be NSF approved, Schedule 40 PVC that is perforated and wrapped with fabric and have 3/8” diameter holes located top and bottom on 4 ft centers. Horizontal sight sump piping shall extend 1 ft minimum beyond the main drain.

11. Chemical feed lines from chemical feeders to recirculation piping shall be Schedule 80 PVC piping. Piping shall be hard piped into the recirculation plumbing. All required valves shall be of all PVC construction.

12. Splash collar(s) for the fill funnel(s) shall be clear Schedule 80 PVC and manufactured from a Type I, Grade I PVC compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in compliance to ASTM D1785.

13. All flanged plumbing connection hardware shall be stainless steel.

14. All materials shall be installed by workmen thoroughly skilled in their trades and all work shall present a neat and mechanical appearance when complete. The CONTRACTOR, at no additional expense to the Owner, shall replace or correct any work not judged acceptable by the Architect, Owner‘s testing agency, or their consultants.

15. All support hardware, brackets, fasteners, hangers, etc. installed in the surge tank shall be 316L stainless steel.

16. No installation shall be made that will provide a cross-connection or interconnection between a distributing supply for drinking purposes and the swimming pool, or between the pool and a sanitary or storm water sewer system that will permit a backflow of water into the pool water system.

17. All piping shall be hydrostatically (water) pressure tested for leaks before and after backfilling to guarantee water tightness. Pneumatic (air) pressure test not allowed.

18. The CONTRACTOR shall provide 1/4" PVC water stops for this work for watertight penetration of concrete walls. Water stops shall be round and the O.D. shall be sized to 150% of the O.D. of the pipe. The water stops shall be thermo-welded to the pipe from both sides and shall be located at the centerline of the wall being penetrated prior to placing the concrete to assure a watertight seal. Manufactured fiberglass and PVC water stop fittings by Daldorado, A.S.A. Manufacturing, or approved equal shall also be acceptable.

19. CONTRACTOR must adhere to all the applicable provisions in Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.

20. All mechanical equipment to be connected into the recirculation piping system shall be done so using flanged or union connections.

21. Provisions shall be made to purge all pipes in the system.

22. Concentric reducers shall be fiberglass by MerMade Filter, Inc., or equivalent reducers of schedule 80 PVC construction.

C. Pipe Hangers and Supports

1. Manufacturer

a. Subject to compliance with these specifications, pipe hanger and support systems shall be manufactured by Cooper B-line (basis of design), Inc, TOLCO, and Anvil International or approved equal.

2. Hangers

a. Pipes 2 inches and smaller

1) Adjustable steel clevis hanger, B-Line models B3100 or B3104.

2) Adjustable steel swivel ring (band type) hanger, B-Line model B3170.

b. Pipes 2-1/2 inches and larger

1) Adjustable steel clevis hanger, B-Line model B3100.

2) Adjustable steel yoke pipe roll, B-Line model B3114.

3. Multiple or Trapeze Hangers

a. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS, Grade 33 structural steel channel, 1-5/8 by 1-5/8 inch minimum, B-Line B22 strut or stronger as required.

b. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe, B-Line B-2000 series.

4. Wall Supports

a. Pipes 2-1/2 inches and smaller

1) Steel offset "J" hook hanger, B-Line model B3600.

b. Pipes 3 inches and larger

1) Welded strut bracket and pipe straps, B-Line models B3064 and B2000 series.

2) Welded steel bracket B-Line model B3066 or B3067 with roller chair or adjustable steel yoke pipe roll. B-Line model B3120 or B3110.

5. Floor Supports

a. Electroplated carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. B-Line model B3093 and B3088T or B3090 and B8088. Pipe saddle shall be screwed or welded to appropriate base stand.

6. Vertical Supports

a. Steel riser clamp sized to outside diameter of pipe, B-Line model B3373.

7. Plastic Pipe Supports

a. V-Bottom clevis hangers with galvanized 18-gauge continuous support channel, B-Line models B3106 and B3106V, to form a continuous support system for all plastic pipes smaller than 1 inch or flexible tubing.

b. A vented and sloped continuous PVC Schedule 40 pipe no smaller than 1-1/2 inch outside diameter will be used to route flexible tubing with the appropriate pipe supports.

8. Supplementary Structural Supports - Design and fabricate supports using structural quality steel bolted framing materials. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch or greater as required by loading conditions. Submit design for pipe tunnels, pipe galleries etc. for approval. Use clamps and fittings designed for use with the strut system.

D. Hanger Attachments

1. Upper Attachments

a. Beam Clamps

1) Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.

2) C-Clamps shall be locknuts and cup point set screws similar to B-Line model B351L or B3036L. Top flange c-clamps shall be used when attaching a hanger rod to the flange of structural steel, B-Line model B3034 or B3033 or approved equal. Refer to manufacturers recommendations for set screw torque. Retaining straps shall be used to maintain the clamp position on the beam where required.

3) Center load beam clamps shall be used where specified. Steel clamps shall be B-Line models B3050 or B3055. Forged steel beam clamps with cross bolt shall be B-Line B3291-B3297 series or approved equal as required to fit beams.

b. Concrete Inserts

1) Cast in place spot concrete inserts shall be used applicable, either steel or malleable iron body, B-line B2500 or B3014 or approved equal. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rods sizes, B-line models N2500 or B3014N series.

2) Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A1011 Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line models B22I, 32I, or 52I or approved equal. Select channel nuts suitable for strut and rod sizes.

E. Hanger Accessories

1. Hanger rods shall be threaded on both ends or continuously threaded rods of circular cross section. Use adjustable lock nuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

F. Hanger Finish

1. Indoor Finishes

a. Hangers shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish.

b. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR shall have an electro-deposited green epoxy finish.

c. Zinc Plated hardware is not acceptable for use in chemical rooms.

G. Valves

1. Valves 3 inches and larger shall be butterfly type valves, with PVC body, 150# SWP with stainless steel shaft, polypropylene disc and replaceable resilient seat bonded to a rigid shaft and guaranteed for bubble tight shutoff from 27 inch vacuum to 150 PSI. Extended neck 2 inch beyond flanges for any insulated piping shall be provided with handle for manual operation. All valve components shall be suitable for swimming pool chlorinated water service. Butterfly valves shall be Georg Fischer Type 563, Asahi/America Type SP Pool-Pro, Chemtrol Model-B, Simtech VP series, Colonial Valve 411 Series, or approved equal.

2. Valves smaller than 3 inches shall be PVC true union ball valves, full port, three-piece construction, blowout-proof stem, Viton seal with socket end connectors.

3. Check valves shall be a quick closing non-slam type, either self-aligning wafer or flanged type, of corrosion resistant materials suitable for use in a swimming pool environment. Install check valves in accordance with the manufacturer's recommendations. Locate check valves at least 5 pipe diameters from pumps and fittings. Provide check valves as indicated, where two pumps are used in parallel. Check valves shall be either by Technocheck Corp., model 5050, with epoxy coated cast iron body and bronze swing plates on a stainless steel spring; or approved equal, for installation between 150 lb flanges.

4. Modulating float valve in the surge tank(s) shall have PVC body and stainless steel wafer disc. All hardware shall be non-corrodible. The float-operated valves shall be provided horizontally on the main drain lines in the surge tank(s). Valve shall consist of all non-corrosion components including shaft, float arm, pins and floats. Valve shall be suitable for mounting on a 125E class standard PVC flange. The float arm leverage weight and pivot lengths shall be adjustable to obtain desired ratio of surge tank level change to pool gutter overflow level change. Two floats and stabilizer required. Valve shall be Model FV-D XWB (Extra Weight Ball) as manufactured by MerMade Filter, Inc. or approved equal manufactured by EPD, or Fluidtrol Process Technologies, Inc.

5. Submerged valves up to 3 inches shall be PVC true union ball valves. Submerged valves over 3 inches shall be PVC bodied, wafer type, butterfly valves with stainless steel handle extensions as required. Valves shall be by approved manufacturers listed above. Submerged valves must be provided with all stainless steel connectors. The stem housing extensions shall be properly supported and braced.

6. All butterfly type valves 8 inches and larger shall be fitted with a water tight gear operator.

7. All valves located 7 feet or greater off the floor shall be fitted with a chain operator.

8. All submerged valves, valves buried below grade, or valves not readily accessible, shall be provided with a stainless steel reach rod and handle.

H. Pipe and valve identification

1. All exposed pool piping shall be equipped with color coded flow directional arrows at thirty (30) inch intervals per local and state swimming pool health code. The Contractor shall verify that all pool piping identification is in accordance with all local and state health regulations.

2. All valves shall be identified with minimum 1-1/2 inch diameter brass tags stamped with minimum 1/2-inch high numbers and attached to valves with #16 brass jack chain. (Plastic laminate engraved tags with nylon attachment acceptable.) Valves shall be described as to their function and referenced in the operating instruction manual and wall mounted piping diagram to be prepared by the CONTRACTOR.

2.6 CHEMICAL TREATMENT SYSTEMS

A. Calcium Hypochlorite (Chlorinator Briquettes)

1. Shop drawings complete with a piping diagram depicting the location in which the dry chlorination feeder is to be connected to the system shall be provided and approved prior to installation. Installation of the system shall be as specified in the manufacturer's directions and no exceptions shall be taken.

2. A factory-authorized representative shall provide training to the owner and the training shall be video recorded per 131100, Section 1.12 of the project contract documents.

3. Accu-Tab PowerBase

a. General Description

1) The system shall be designed to feed low concentrations of calcium hypochlorite in solution intermittently or continuously as required for pool applications. The system shall be a single pre-assembled, package unit with a welded aluminum frame consisting of chlorinator, electrical box, centrifugal pump, and solution tank for ease of installation and operation. The system shall be the Accu-Tab PowerBase. Only Accu-Tab Blue SI calcium hypochlorite tablets shall be used, the patented blue colorant added for safety (to help prevent accidental mixing with other chemicals).

2) The base proposal requires providing equipment as specified herein, though substitutions will be considered. The bidder is cautioned that substitutions must meet the quality and operational requirements of each feature specified in Section 2 below. Batch systems with pressure mixing components producing chlorine concentrations exceeding the limits of the specifications will not be considered.

3) Any system offered shall use an NSF Standard 50 listed erosion feeder and tablet combination, and shall be capable of meeting all requirements of the Health Department having jurisdiction over the installation.

4) Basis of Design:

a) Competition Pool: Model 3070AT

b) Dive Pool: Model 3070AT

c) Endless Pool (Alternate #2): Model 3012 inline system

b. System Features

1) A maximum chlorine solution level of 0.05% (500 ppm) shall be maintained to prevent calcification in system components. Systems producing chlorine concentrations higher than 0.05% shall not be acceptable.

2) Delivery shall be by erosion feed technology to control accurate and consistent concentration limits in the chlorine treatment solution. Soaking type, spray and/or vortex technology systems shall not be acceptable.

3) The chlorinator shall automatically and continuously feed a limited quantity of chlorine in solution as needed; when the system is not running, no more chlorine than that amount which can be fed in one minute or less shall be left in the tank to prevent dilution. Batch systems preparing excess quantities of solution for delivery over an extended period shall not be acceptable.

4) A centrifugal pump wired to the system electrical box shall feed freshly mixed chlorine treatment solution only as required for maximum efficiency. Batch systems requiring the use of a metering pump or pumps to feed pre-prepared standing solution shall not be acceptable.

5) All piping in the chlorinator unit shall be Schedule 40 PVC. Systems with flexible tubing shall not be acceptable.

c. System Components

1) Tablet Chlorinator. Accu-Tab PowerBase chlorinators are designed exclusively for Accu-Tab Blue SI calcium hypochlorite tablets. Tablets are placed on a sieve plate inside the chlorinator; as water flows across the sieve plate, the tablets erode at a rate proportional to the flow rate.

2) Inlet Water Supply Connection.

a) Model 3012 - 1" FNPT (water supply of 10 GPM required).

b) Model 3070AT - 1-1/2" FNPT (water supply of 30 GPM required).

3) Inlet Solenoid Valve. Opens and closes on command when the system receives a signal. 110 VAC required from chemical controller. Applicable to models 3140AT and 3500.

4) Inlet Water Strainer. A strainer to protect chlorinator components from start-up debris and sand from broken filter laterals.

5) Flow Meter. A rotameter flow meter, measuring the flow of the water-eroding stream to the chlorinator.

6) Inlet Control Valve. PVC gate valve mounted in line with the flow meter allows operator to adjust flow of water-dissolving stream. Applicable to models 3140AT and 3500.

7) Solution Tank. PowerBase 3500 made of HDPE, all others made of PVC. Capacities:

a) Model 3012 7.5 gallon

b) Model 3070AT 22 gallon

8) Float Valve. Made from Schedule 80 PVC and 316L stainless steel, this float valve maintains the solution tank level.

9) High Level Switch. Prevents the solution tank from overflowing. High level: when activated, a switch opens the circuit to the solenoid valve, causing the solenoid valve to close. Applicable to models 3140AT and 3500.

10) Solution Delivery Pump. Delivers chlorinated solution to the return line. A single-stage centrifugal pump is provided for systems with pressures up to 20 PSIG. (For systems requiring a discharge pressures greater than 20 PSIG, a custom selected pump shall be utilized.)

11) Discharge Check Valve. A PVC swing check valve prevents reverse flow of water into the system.

12) Discharge Control Valve (manual). Used to balance system output water flow with system input water flow.

13) Outlet Connection

a) Model 3012 1" NPT

b) Model 3070AT 1.5" NPT

14) Aluminum Frame. Type 6061-T.

15) Nema 4X Electrical Enclosure

d. Optional Equipment

1) High Pressure Pump. On systems requiring unit discharge pressures greater than 20 PSIG.

2) High-High-Low (HHL) Level Switch. A second high level switch (Hi-Hi) is installed above the high level switch that will run the solution delivery pump in case of an upset condition in the solution tank. A low level switch will protects the pump by preventing it from running dry.

e. Electrical Requirements

1) Two electrical circuits are required for operation: (1) 110v 15 amp power, and (1) 110v control circuit from a pool controller.

B. pH Buffering System (Muriatic Acid)

1. Chemical feeders for muriatic acid shall be peristaltic type pumps. Chemical feed pump(s) shall be provided and connected to the filtered water return lines to the pool(s) as shown on the pool plans. The pump(s) shall be capable of feeding a solution to the pool(s) to maintain pH level against the back pressure involved and shall be fully adjustable while in operation.

2. The pump(s) shall be provided complete with fractional horsepower motor for 120V 60 Hz current, plastic feed lines, and fitting necessary for connections to pool system piping.

3. The chemical pump(s) shall be electrically connected to and operated by the water chemistry controllers.

4. The acid pump(s) shall be affixed with a metallic stamped label indicating the chemical being pumped and the pool to which it is connected.

5. Provide non-metallic wall mounted shelf support for the chemical feeder(s).

6. Provide six (6) fifteen (15) gallon acid drums.

7. Provide two (2) two drum modular spill platform. Platform shall be molded high-density polyethylene with removable polyethylene grating. Platform shall be 26.25" x 51.5" x 6.5" with a spill capacity of 30 gallons and a load capacity of 5,000 pounds. Platform shall be an Eagle two drum modular spill platform model 1632, or approved equal.

8. Provide one (1) low profile ramp. Ramp shall be molded high-density polyethylene. Ramp shall be an Eagle low profile ramp model 1689, or approved equal.

9. Provide "Vapor Shield" vent check valve for the acid drum/tank which seals container while allowing the liquid to be removed via pump. The Vapor-Shield shall prevent an internal vacuum and collapse of a sealed container. It will also prevent the pump from developing a vacuum-lock while attempting to remove the liquid from the sealed container. The Vapor-Shield shall prevent the release of any acid

vapors. The Vapor-Shield body shall be constructed entirely from schedule 80 PVC with polypropylene tube fittings and factory-installed acid resistant viton sealant on all threaded connections. The diaphragm and o-rings shall be constructed of acid resistant viton. No metallic or materials not rated appropriate for use with acid shall be used. The Vapor-Shield shall be fitted with a ¾" male NPT threaded fitting to allow for the installation onto any common: five (5) through fifty-two (52) gallon acid shipping container caps and lids. The unit shall be supplied with no less than fifteen (15) feet of 3/8" polyethylene tubing. Recreonics catalog no. 52-095. An Acid Fume Scrubber, part #7747090, with refill reagent kit, #7747091, manufactured by ProMinent shall be considered an equal.

10. Chemical feeders to be manufactured by G. H. Stenner & Co.,or approved equal.

    a. Competition Pool Acid Pump (one required): Model 45M3 22 GPD

    b. Dive Pool Acid Pump (one required): Model 45M3 22 GPD

    c. Endless Pool Acid Pump (one required)(Alternate #2):Model 45M1 3 GPD

C. Ultraviolet Dechloramination and Disinfection System

1. Ultraviolet Disinfection Equipment: Shall operate within the UVC electromagnetic spectrum emitting wavelengths in the range of 200nm to 400nm. This required wavelength will provide constant disinfection/inactivation of bacteria, algae, molds, viruses and destruction of Monochloramines, Trichloramines, and Dichloramines. Ultraviolet Lamp/Chamber and Spectra Touch Control Panel by Engineered Treatment Systems or Architect/Engineer approved equal. Any deviation/exception must be provided in writing to and approved by the designer prior to the bid date.

    a. Ultraviolet disinfection equipment by Aquionics and Prominent are approved equals.

2. The UV System shall have an MET or equivalent (ETL, CSA, or UL) listing, be NSF-50 2014 certified including Section 14.18 (crypto inactivation) or 3rd party validated to the USEPA UVDGM 2006 Guidelines.

    a. Equipment General Description: The Ultraviolet System shall be provided in a complete package to include: 316L Schedule 10 Stainless Steel Chamber, Spectra Touch Control System located in a NEMA 12 (IP52) rated panel, Medium Pressure Bulb(s) designed to emit wavelengths within the UVC electromagnetic spectrum, UV EZ Clean strainer, automatic wiper system, and Project Commissioning by a Certified ETS Ultraviolet Technician.

3. ECP Units: Ultraviolet manufacturer to offer unit capability of a horizontal OR vertical installation application using state of art design and direct flow through characteristics. Direct flow will be required in order to reduce total head loss through the system. Unit shall be a Single Lamp medium pressure system with a bulb of 1.3 kW power range. ANSI/DIN (as specified) flange of 3"/80mm and flow pattern of up to 260 GPM/1145 m3 /hr @ 94% UVT, Any systems validated or designed for flows based on 98% UVT are not acceptable. Chamber and Control Cabinet shall be as indicated on the drawings. The electrical requirements include either 208/220/230 volt single-phase 50/60 Hz power (as specified) with a 20 amp external breaker. All required electrical work to be performed by licensed electrician.

4. ECF Units: Ultraviolet manufacturer to offer unit capability of a horizontal OR vertical installation application using state of art design and direct flow through characteristics. Direct flow will be required in order to reduce total head loss through the system. Unit shall be a Multiple Lamp medium pressure system with a bulb range of (2) 1.0 kW – (4) 3.0 kW power range. Multiple lamp system is required in order to maintain quality disinfection in the event of a single bulb failure. ANSI or PN (as specified) flange range of 4"/100MM – 12"/300MM and flow pattern of 350 to 3700 GPM (1540 m3/hr to 16,313 m3/hr). @ 94% UVT. Any systems validated or designed for flows based on 98 % UVT are not acceptable. Chamber and Control Cabinet shall be as indicated on the drawings. Electrical requirements are indicated in the table below. The electrical contractor is to take into account plus/minus 3% for external breaker. All required electrical work to be performed by licensed electrician.

Pool Type	Model Number	US EPA 3-log and calculated 40mj/cm2 (GPM)	Calculated 60 mj/cm2 (GPM)	NY DOH Validated 40mj/cm2 (GPM)	Lamps	Power (KW)	Voltage (V) with Breaker Size
Endless Pool (Alternate #2)	ECP-113-5SPV	260	176	100	1–1.3kW	1.3	220 V (1ф)– 20A
Competition Pool	ECF-430-12V	3705	3350	1980	4–3.0kW	12.0	480 V (3ф)– 50A
Dive Pool	ECF-430-12V	3705	3350	1980	4–3.0kW	12.0	480 V (3ф)– 50A

5. Ultraviolet Chamber

   a. Pressure rated for 100 psi/8 Bar (tested to 150 psi/11 Bar), and pressure drop across the unit will be minimal. The unit shall be constructed of 316L stainless steel, schedule 10 pipe, passivated to prevent corrosion within the harsh pool environment. The Ultraviolet chamber shall come complete with the following equipment.

      I. Ultraviolet intensity monitor factory calibrated to provide intensity in mw/cm2, it must include a built-in alarm system to notify operator when output level drops below required level of 60 mj/cm2 for indoor pools or 40mj/cm2 for outdoor pools (or operator set dosing levels).

      II. Ultraviolet temperature control system shall be provided to maintain system integrity in the event of flow interruptions to the chamber.

      III. Ultraviolet chamber shall come complete with annealed quartz sleeve with “O” ring seals for water tightness.

      IV. Chambers shall be complete with ANSI or DN flanges (as specified) and all ports or vents shall be threaded NPT. The Ultraviolet chamber must be capable of installation in the system so that it remains full under all conditions.

      V. The Ultraviolet unit must be complete with integrated brackets or feet for ease of installation in either vertical or horizontal mounting.

      VI. The Chamber shall have a sacrificial anode attached to the chamber, extending inside the chamber and be bonded to the installation bond loop.

6. Ultraviolet Lamp

   a. Ultraviolet lamp shall be medium pressure high intensity. Lamp shall be designed to emit continuous Ultraviolet wavelengths in the range of 200nm to 400nm. This will provide optimal disinfection benefits and destruction of the Monochloramine, Dichloramine, and Trichloramine compounds. Lamp must remain unaffected by temperature variance of 0 degrees F (-17 C) to 200 degrees Fahrenheit (93 degrees Celsius).

   b. The lamp system must provide a constant dose of not less than 60 mj/cm2 until the end of the lamp life for indoor applications and not less than 40 mj/cm2 for outdoor disinfection and this must be based on constantly monitoring the full recirculating flow rate, not on a side stream treatment. The system must be equipped with variable power control to control the intensity & dose of the lamp in 1% increments.

7. Automatic Wiper System

   a. An automatic cleaning system shall be provided for cleaning of quartz sleeve and Ultraviolet monitor probe. The system shall travel the entire length of the quartz sleeve twice per desired

cleaning cycle. Precision molded wiper rings shall be provided to ensure thorough quartz tube cleaning and quartz tube protection. Wiper cycle shall be user selectable and adjustable within a range of 5 minutes to 24 hours depending on anticipated application and deposit build-up.

8. UV Strainer

   a. The UV system must be provided with a downstream strainer to protect against the possibility of lamp/quartz breakage traveling downstream.

9. Ultraviolet Control System

   a. Control cabinet shall be an ETS SPECTRA Touch control unit and or pre-approved equal. The cabinet shall be an epoxy coated NEMA 12 / IP52 rated cabinet. If mounted outdoors it must be a NEMA4X /IP56 rated cabinet with an integral A/C unit to protect the components from the environment. The power must be controllable to provide full power, half power and infinite variable power based on real time interface with changes in UVT, Flow Rate or Combined Chloramines. Three levels of operation shall be provided to meet the needs of the operator and pool environment: Simple Control (start, stop and reset), Full Parameter Display, and Customized Operator Configuration. Modes of operation shall be password protected to secure system critical setup functions. Touch Control system shall have clearly identifiable start, stop, and reset icons (suitable for gloved operation) with Running and Fault LCD indicators.

      I. The main Touch screen shall display a minimum of the following: Ultraviolet calculated dose (derived from flow and intensity inputs), Ultraviolet intensity (as a % and mw/cm2), Lamp Current, Flow rate (accepts signal from optional flow meter – displayed as gallons per minute or m3/hour), Chamber temperature (displayed as deg. F or deg. C), Operation hour meter, and fault indicators to include Lamp fault, low Ultraviolet & temperature alarm, Ground fault trip, Wiper fault. All alarm functions shall have simple text message display to assist in fault finding.

      II. Touch Control system shall have a minimum of the following system interface controls: Remote operation, Process interrupt features (from valves, flow meters), Low UV dose (configurable to shutdown or alarm only), Flow meter input, Auto-Restrike, Half to full power Ultraviolet setting with 24 hour/7 day settable timer. Variable power/Dose pacing interface.

      III. Touch Control system shall have built in data-logging capabilities to record the following information: Ultraviolet intensity required, Ultraviolet intensity measured, Lamp current, Chamber temperature, Flow rate (if flow meter is connected), Time and date stamp, All alarms generated.

      IV. Touch Control system must be able to be interfaced with a Chemistry Controller that can measure Total or Combined Chloramines in order to maintain the proper dosage required during the life of the lamp.

      V. Touch Control system must be able to interface with any automatic or semi-automatic filtration controller.

      VI. Touch Control system must be capable of operating through Ethernet or Wi Fi.

      VII. Touch Control system must be capable of interfacing with a SCADA system including both Profibus and Modbus.

10. System Startup

    a. Install in accordance with contract documents and manufacturer's instructions.

    b. Commissioning:

I. Ultraviolet Chamber and Control Panel shall be commissioned by a qualified factory trained technician to institute the warranty.

II. Final electrical and control cabling will be connected from the Touch Control cabinet to the Ultraviolet disinfection chamber during the commissioning process.

III. Daily operation and simple maintenance instructions shall be provided during the commissioning process.

11. Warranty

a. All components, excluding lamps, quartz and seals, shall have a limited warranty to be free from defects in workmanship and materials for a period of 12 months from date of start-up. Medium pressure Ultraviolet bulbs shall be warranted for a period of 8,000 hours. Intermittently operated lamps (1 on/off cycles per day) will be replaced free of charge should failure occur prior to 4,000 hours and replacement will be prorated between 4,000 and 8,000 hours.

b. Manufacturer must maintain spare or replacement parts in the USA for same day or not longer than next day delivery in North America.

2.7 WATER CHEMISTRY MONITORING AND CONTROL SYSTEMS

A. The water chemistry control system for the competition pool and dive pool shall provide continuous monitoring and control of sanitizers, oxidizers, pH, ORP, free chlorine, temperature, system flow rate and water chemistry balance calculations. The controller shall manage the recirculation pump with a programmable Fireman Cycle feature, which automatically turns off the Heater, UV and Auxiliary systems prior to shutting off the recirculation pump. All line-voltage wiring shall be performed in a separate NEMA 4X enclosure that precludes access to the controller electronics. Installation of the system shall be per the manufacturer's specification and no exceptions shall be allowed. A factory trained/authorized representative shall provide training to the Owner and the training shall be videotaped per 131100, Section 1.12 of the project contract documents. The specified controller, a BECSys7 manufactured by BECS Technology, Inc. shall be provided or Chemtrol by SB Control Systems, AcuTrol by Pentair, ProMinent, or a technically equal system capable of providing equal performance for all operating functions. Provide a BECSys3 for the Endless Pool (Alternate #2).

B. Certifications

1. The controller shall carry the following product certifications

a. NSF/ANSI Standard 50;

b. UL 61010-1

C. Sensors

1. The controller shall come with the following sensors

a. pH - The controller shall provide a measurement of pH by utilizing a sensor with the following characteristics:

1) 0 – 14 sensing range

2) ABS body with ½" NPT process connection

3) Minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal

4) A porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction

5) A silver/silver chloride (Ag/AgCl) reference element

6) A general purpose glass membrane pH sensing element

7) Operating temperature range of 0 - 80 degrees C

8) Operating pressure range of 0 - 100 psiG.

9) The controller shall continuously monitor, display and data log pH with 0.1 or 0.01 resolution (programmable).

b. ORP - The controller shall provide a measurement of ORP by utilizing a sensor with the following characteristics:

1) -1000 to +1000mV sensing range

2) ABS body with ½" NPT process connection

3) Minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal

4) A porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction

5) A silver/silver chloride (Ag/AgCl) reference element

6) A solid platinum or solid gold ORP sensing element with a minimum of 1 cm^2 surface area; platinum-plated and gold-plated sensing elements, which are susceptible to abrasives, shall not be considered equal

7) Operating temperature range of 0 - 80 degrees C

8) Operating pressure range of 0 - 100 psig

9) The controller shall continuously monitor, display and data log ORP with 1mV resolution

c. Flow Sensor - The controller shall provide a measurement of pool circulation flow rate and volume by utilizing a flow sensor with the following characteristics:

1) 0-8800 gpm (0-33265 liter/min) measuring range,

2) Magmeter flow sensor with a frequency output,

3) Dual O-ring seal,

4) Cable to meet length requirement for installation,

5) Saddle to meet return line size,

6) Flow volume: 999 trillion gallons, 1 gallon resolution; 999 trillion liters, 1 liter resolution.

7) The controller shall continuously monitor, display and data log flow rate with 0.1 gpm resolution.

d. Temperature - The controller shall provide a measurement of water temperature by utilizing a sensor with the following characteristics:

1) 32 – 212°F (0 – 100°C) sensing range;

2) 2 wire, 100Ω resistive temperature detector (RTD) with a 0.00385 Alpha.

3) The controller shall continuously monitor, display and data log temperature with 1°F resolution.

e. Free Chlorine Sensor - The controller shall provide a measurement of free chlorine by utilizing an amperometric sensor with the following characteristics:

1) 0.0 to 20.0 mg/l (ppm) measuring range with fully selectable scale,

2) 32° - 113°F operating temperature range,

3) A PVC body,

4) Replaceable PTFE membrane and electrolyte,

5) Gold cathode and silver/silver chloride anode.

6) The controller shall continuously monitor, display and data log free chlorine with 0.1 mg/l resolution.

f. 4-20mA Sensors

1) Total Chlorine Sensor (with Combined Chlorine Reading) - The controller shall provide measurement of total chlorine utilizing a sensor with the following characteristics:

a) 0.0 to 20.0 mg/l (ppm) measuring range,

b) 41° - 113°F operating temperature range,

c) Replaceable PTFE membrane and electrolyte,

d) Gold cathode.

e) The controller shall continuously monitor, display and data log total chlorine with 0.1 mg/l resolution. The controller shall also continuously monitor, display and data log combined chlorine (from the total chlorine and free chlorine sensors) with 0.1 mg/l resolution.

D. User Interface

1. Standard Display - The standard display shall be a backlit transflective LCD with 14 line x 40 alpha/numeric graphical characters that will continuously display information related to the following:

a. All installed sensor readings

b. Set points, with current control status

c. All active alarms, including time activated

d. Smart menus w/ integrated on-screen help

e. Contrast adjustment of the backlit LCD shall be provided through clearly marked keys on the front-panel without the need for access to internal controller circuitry. After initial adjustment, controller

shall monitor internal temperature and automatically adjust contrast to prevent LCD blackout in extreme ambient temperature conditions. Controllers that do not include front-panel contrast adjustment and automatic temperature compensation shall not be considered equal.

f. The standard user interface shall include single-touch access to Set Points, Relay Modes, Calibrations, Backwash status and settings, Menu access, and Reset Fail/Safes. An alphanumeric keypad shall be provided for ease of system configuration.

E. Control Functions

1. Water Chemistry

a. pH Control: The controller shall continuously control pH. Chemical feed shall be configurable for feed-up, feed-down, or dual feed and either on/off or time-based proportional feed.

b. Sanitizer Control: The controller shall continuously control sanitizer based upon the ORP reading, the amperometric sensor, or both with a bracketed control program. Chemical feed shall be configurable for either on/off or time-based proportional feed.

c. Bracketed Sanitizer Control: With the amperometric ppm sensor, the controller shall be configurable for bracketed sanitizer control; The bracketed control algorithm shall allow either the ORP or ppm setpoint to be chosen as the primary control point, while using other parameter to create a secondary boundary (min and max settings) that must be maintained in addition to the primary control point.

d. Sanitizer Booster Feed: The controller shall have a sanitizer booster program with selectable ORP and/or ppm set points with separate ending set points, allowing the option of the booster sanitizer to control to a lower set point while the primary system can recovers.

e. UV Control: A Fireman Cycle feature shall turn off (ramp down) the UV relay 0 to 60 minutes (settable) prior to backwash initiation or recirculation pump shutdown.

f. Superchlorination: The controller shall have a programmable superchlorination function, based upon ORP or ppm superchlor setpoint, which is triggered manually.

g. Dechlorination: The controller shall have a programmable dechlorination function, based upon ORP or ppm dechlor setpoint, which is triggered either manually or by the completion of the superchlorination function.

h. LSI & RSI: The controller shall compute the Langelier Saturation Index and the Ryznar Saturation Index based upon current inputs and the Ca Hardness and Alkalinity entered by the operator.

2. Expanded

a. Flow Monitoring: The controller shall continuously monitor, display, and datalog system flow, maintaining a total flow volume. A Low Flow Alarm shall be operator settable, which can be programmed to disable chemical feeds. Controller shall also have a Minimum Flow Rate setting to turn off heater whenever system flow is less than this programmed minimum level.

3. Energy Conservation

a. Alternate Setpoints: The controller shall have alternate Sanitizer, Heater, and Autofill setpoints, based upon a 4 event 28 day timer.

b. Energy Conservation Mode: The controller shall have the capability to disable all mechanical and chemical functions during programmed conservation cycle. The Energy Conservation Mode shall

include the ability to periodically monitor and satisfy all operation requirements based upon a programmed time schedule.

F. Main Recirculation Pump

1. On/Off Control with Relay

a. Controller shall provide the capability to interface to and control a recirculation pump with a programmable relay. The controller shall provide 3 operator-settable independent Fireman Cycle settings and relays for the UV controls. The controller shall include the following capabilities, available as appropriate based upon installed sensors and implemented features:

1) Fireman Cycle: Upon the following events, the controller shall automatically delay recirculation pump shutdown until the UV controls have been deactivated and the corresponding Fireman Cycles have expired:

a) Backwash Operations

b) Energy Conservation mode (24 hr., 7 day function)

c) Manual off (per Operator)

2) Immediate: Upon the following events, the controller shall immediately turn off the recirculation pump (and UV controls), without first satisfying Fireman Cycle timing requirements:

a) Surge Tank Level Low Alarm: Turn off pump immediately (surge tank is almost empty)

b) Strainer Vacuum High Alarm: Turn off pump immediately (possible entrapment)

c) Emergency shutdown, triggered by front-panel Emergency Off: Turn off pump immediately (per Operator)

2. VFD Interface with 4-20mA signal

a. Controller shall provide the capability to interface to and control a recirculation pump equipped with a Variable Frequency Drive (VFD) through a 4-20mA signal. The controller programming shall allow the operator to manage the VFD entirely from the water chemistry controller, by providing the following capabilities:

1) Programmable setpoint specified as either flow rate, effluent filter pressure, or fixed setting,

2) Four programmable operator-triggered alternate profiles (“Manual Turndowns”),

3) Four programmable scheduled alternate profiles (“Scheduled Turndowns”),

4) Override setting for backwash,

5) Ramp up and ramp down settings,

6) Minimum output setting.

7) Remote access to current VFD status and all VFD parameters shall be provided through the BECSys for Windows PC software provided with controller. The name of each alternate profile shall be changeable by the operator, so that VFD menus and data log entries are intuitive and recognizable by the users of the system.

8) Systems that do not provide both local and remote management of the VFD through the water chemistry controller shall not be considered equal.

G. Control Outputs

1. Relay Outputs

a. Solid-State Relays

1) The controller shall come with a total of 4 integral line or dry contact 5A solid-state relay outputs capable of switching 3A under all normal operating conditions, accounting for the effects of the temperature gradient inside the NEMA 4X enclosure. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity. All solid-state relays shall have a provision for an electrical interlock with the circulation pump motor starter.

2. Mechanical Relays

a. The controller shall come with a total of 5 mechanical relays:

1) 1 integral 8A dry contact mechanical relay, and

2) 4 integral 3A dry contact or line powered mechanical relays.

3) Since mechanical relays have the inherent risk of failing in the closed (active) position, as a safety measure the controller shall preclude the ability to assign any of the integral mechanical relays to chemical feed functions. Systems that do not preclude mechanical relays from being configured for chemical feeds shall not be considered equal. All mechanical relays shall have a provision for an electrical interlock with the circulation pump motor starter.

3. Solid-State Relay Expansion Modules

a. Each Solid-State Relay Expansion Module provides 5 integral 5A solid state dry contact or line powered relays capable of switching 3A under all normal operating conditions. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity. All solid-state relays shall have a provision for an electrical interlock with the circulation pump motor starter.

4. Mechanical Relay Expansion Modules

a. Each Mechanical Relay Expansion Module provides 5 integral mechanical relays:

1) 1 integral 8A dry contact mechanical relay, and

2) 4 integral 3A dry contact or line powered mechanical relays.

3) Since mechanical relays have the inherent risk of failing in the closed (active) position, as a safety measure the controller shall preclude the ability to assign any of the integral mechanical relays to chemical feed functions. Systems that do not preclude mechanical relays from being configured for chemical feeds shall not be considered equal. All mechanical relays shall have a provision for an electrical interlock with the circulation pump motor starter.

5. 4-20mA Outputs

a. The controller shall come with eight separately isolated 4-20mA output signals with a load capacity of 440Ω per output channel. Each output signal shall be independently configurable for either of the following functions:

1) Any enabled input, scaled between two operator-defined end points,

2) VFD control of recirculation pump.

H. Safety Features

1. Manual-On limit

a. The controller shall have built-in limits to the amount of time any relay control output may be forced on (i.e. in “Manual On” mode). This is an important safety feature to prevent control outputs from inadvertently being left forced on after service or diagnostics.

2. High/Low Alarm Settings & Control Lockouts

a. The controller shall have programmable high and low alarm settings for pH, ORP, PPM, temperature, low flow & no flow and chemical overfeed, turbidity, pressure & vacuum, surge tank levels, chemical inventory. The controller shall have a programmable lockout of sanitizer feed upon pH high or low alarm.

3. No Flow Alarm & Flow Restored Delay

a. The controller shall activate a No Flow alarm when the dedicated sample stream flow switch indicates there is insufficient flow through the sample stream. This No Flow alarm shall lockout all chemical feed control operations. The controller shall include a Flow Restored Delay, which shall extend the No Flow lockout user-programmable amount of time after the No Flow alarm ends (i.e. flow is restored). This feature is necessary to assure that the system has valid, stable sensor readings of circulating water prior to making chemical feed control decisions.

4. Feed Limit Alarms

a. The controller shall trigger a FailSafe alarm if a chemical feed relay remains on longer than the programmable Feed Limit Timer. Chemical feeds shall automatically be disabled if the corresponding reading goes into a FailSafe alarm condition.

5. Emergency Off

a. The controller shall have a dedicated Emergency Off button on the front panel of the system, which immediately halts all chemical feeds and control outputs when pressed. This feature shall be password protectable, which shall require entry of one of the Security passwords.

6. Safety shield

a. The controller shall include a safety shield or other mechanism for allowing fuse replacement without access to high voltage circuitry or wiring.

I. Security

1. The controller shall have three security password levels: six for operators, two for managers and one for the distributor providing for a history of access identified by the user.

J. Data Logging

1. The controller shall have 512K battery backed-up RAM for input level recording and events. All input level shall be recorded for 10 to 56 days depending on sample rate (2 to 10 minutes).

2. The controller shall record and maintain the latest 1100 events over a maximum of 14 days recording all alarms, parameter changes, user logins, and operational cycles related to all control features.

K. Local Alarms Indicators

1. The controller shall signal all alarm conditions with the following indicators:

a. A bright red flashing LED on the front of the controller,

b. Activation of a master alarm signal provided as a dry contact relay enabling the use of 0-240 VAC alarms, and

c. Each active alarm listed on the LCD display along with time activated.

L. Remote Communication, Access & Alarm Notification

1. Ethernet

a. The controller shall come with a standard, integral 100BaseT Ethernet connection. The controller shall be capable of providing Remote Access via PC with Ethernet connection and Alarm Notification via email or text message via an Ethernet connection to the Internet.

2. Remote Access

a. The controller manufacturer shall provide BECSys for Windowsä graphical remote operation software, for interactive connection to the controller from a PC. Remote operation software shall be Vista-compatible, and have all of the following operational modes:

1) Site Data Base – for organizing and accessing multiple controllers on site, or at multiple sites.

2) Graphical Operator's Console – to display current readings, setpoints, alarm points and control status in an easy-to-read graphical mode.

3) Data Log Graphing – to review data logs with time-synchronized event data; data log traces shall be configurable, with color and line style selectable by operator.

4) Full Menu Tree – All system parameters accessible through a full menu tree interface.

5) Auto-Polling – to allow automatic download of data logs from all controllers in site database.

3. Alarm Notification

a. The controller shall be capable of providing alarm notification to 8 different recipients. Each recipient shall be individually configurable to receive alarm notification by one of the following methods.

1) Email: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

2) Text Message: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

3) Fax: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.

4) Numeric Pager: Notification message shall include callback number. Controller shall acknowledge pager notification when callback is received, and not notify subsequent recipients programmed for pager notification.

4. The controller shall support an MS/TP (RS485) or TCP/IP (Ethernet) BACnet connection to 3rd party applications such as EMS, BMS, BAC and SCADA systems. The BACnet connection shall support access to Inputs (current readings), System Information, Set Points, Alarm Points, Control Status and Alarms. Set Points and Alarm Points shall be modifiable from the 3rd party application via the BACnet interface.

5. Wi-Fi

a. The controller shall come with a BECSys Wi-Fi module, which allows wireless integration into existing Wi-Fi networks.

M. Enclosures

1. The controller shall be housed in a NEMA 4X polycarbonate enclosure.

2. Field wiring enclosure - All high voltage field wiring shall be through a separate NEMA 4X enclosure that precludes access to controller electronics. All high voltage connections shall be clearly identified and a field wiring diagram shall be provided with the controller for installer reference. All controller high-voltage relay assignment parameters shall be programmed at the factory prior to delivery to installation location.

N. Flow Cell

1. Lighted flow cell

a. The flow cell shall have a polyethylene body with two ½“ NPT ports for pH and ORP sensors, two ¼“NPT ports for temperature sensor and sensor wash acid injection, integrated flow switch and clear acrylic front viewing windows. The flow cell shall also include a port for the CP-1 free chlorine sensor, if present. The flow cell shall be backlit to support inspection of sensors, and red LEDs shall illuminate to indicate a No Flow condition. The flow cell design shall provide precise sample flow rate and water velocity regulation past the sensors. The flow cell shall come provided with PVC ½” isolation ball valves and PVC ¼” wet test valve.

b. Each flowcell shall be equipped with a pressure-sensing device. The pressure sensor shall consist of a compound pressure/vacuum gauge manufactured in stainless steel, 2 ½” diameter, liquid filled with an operating pressure range of 0 to 60 psig and vacuum of 0 to -30 in./ Hg.

O. Start-up and Manuals

1. The control system shall be provided with on-site start-up, on-site operator training, and 1 year on-site warranty service performed by a representative trained and authorized by the controller manufacturer.

2. Manufacturer shall supply an Operation and Maintenance Manual describing features, operating instructions, maintenance procedures and replacement parts.

2.8 FLOW METERS

A. Flow Meter

1. Flow meters (3 required) shall be installed according to the manufacturer in the filtered water return lines to each of the pools. Flow sensor shall be the GF Signet 2551 insertion magmeter. Provide the coaxial cable from the sensor to the display/transmitter. Flow meter accuracy shall be +/- 2% of reading. The flow instrument shall have a LCD for simultaneous display of four-digit flow rate and eight-digit totalizer. Display/Transmitter capability will be part of chemical controller function or as separate Signet GF Signet

9900 display/transmitter. Signet GF Signet 9900 display/transmitter shall be powered by 24VDC and provide a 4-20mA output.

2. Backwash piping flow meter (3 required) shall be a pilot, impact ball, variable area type with one piece, impact resistant machined acrylic plastic body. GPM scale to be permanently etched or imprinted on the meter. Flow rate indicator to be of stainless steel material. Scale range to be appropriate for specific flow rate. Pipe size to accommodate backwash rate. Backwash piping flow meter shall be BLUE-WHITE series F-300 or approved equal.

B. Refill Flow Meter

1. Refill flow meter (2 required) shall be installed on dilution piping to backwash tank. Flow meter shall be one piece meter body of injected molded polysulfone adapters, viton o-ring seals, and 316L stainless steel floats and float guide, impact resistant machined acrylic plastic body. GPM scale to be permanently etched or imprinted on the meter. Flow rate indicator to be of stainless steel material. Scale range to be appropriate for specific flow rate. Manufacturer shall be BLUE-WHITE or approved equal Model F-45750L-12, 3/4" M/NPT @ 1.0 to 10.0 GPM.

2.9 WATER LEVEL CONTROLLERS

A. In Surge Tank Water Level Controller

1. Provide a water level sensing and control system for each of the Dive Pool and Competition Pool that will monitor the water level in the surge tank and automatically activate the auto water make-up control valve. For sensing water level and activating make-up water control valve for each pool, use Series ELC-810 Controller housed in a watertight NEMA 4X UL94 5V UL flammability rated polycarbonate enclosure to meet IP66 and NEMA 4, 4X, 12 and 13 ratings. The Controller shall utilize two sensor(s) to control water level. ELC-810 series shall have a menu-driven LCD display screen and utilize a five-switch user interface for navigation through the menu. The menu shall allow changing the following settings: delay to shutoff, alternate sensor option, maximum time on, manual override, delay to normal, type of sensor, high level option, flow sensor active, and sounder with alarm. All menu settings shall be capable of password protection. The Controller shall be capable of displaying the following data: last fill time, last drain time, last alarm. The Controller shall be capable of determining the following: maximum time on exceeded, over current to solenoid valve, no valve/valve wiring problem, and sensor not working properly. The Controller shall have a low voltage interlock with auto water make-up solenoid valve, shall provide adjustable time delay for increasing level and manual override; and shall require 115 VAC, 1 phase, 60 Hz power. Manufactured by AquatiControl Technology, Model ELC-810-DS-ST-XXX (Contractor to coordinate the specific length(s) of cable required for each controller prior to ordering). Refer to drawings for additional information. Provided and installed by CONTRACTOR and connected by electrical.

2. Provide a solenoid valve for high level sensor, normally opened, stainless steel fitted, bronze body, 24 VAC slow closing type. Size to pipe. Interlock with automatic water level control system. Refer to the Drawings for additional information. Such as ASCO, or approved equal.

3. Provide a proximity switch sensor that shall be sensitive to within +/- 1/8" (4mm) of nominal water level. Supply voltage to sensor shall be 12V to 24V DC from Controller. Current consumption shall be < or = 15mA. Response frequency shall be 100Hz. Maximum control output shall be 200mA. Sensor operating temperature shall be -25 Deg. C to 70 Deg. C. Operating humidity shall range from 35% RH to 95% RH. Sensor shall be mounted in a 1" SCH80 PVC pipe (length to be determined by depth of surge tank). Sensing pipe to be mounted to surge tank wall with composite/non-metallic hangers and stainless steel hardware. Sensing pipe shall be capable of being submerged under water safely. Refer to drawings for additional information.

4. Wiring from the sensor to the Controller shall be provided and shall be connected to the terminal points mounted within a corrosion-resistant, nonmetallic NEMA 4X enclosure. All wiring connections shall be made through the bottom of the enclosure. The enclosure size shall be no less than 8" wide x 5" high x 4"deep. The access door shall be the entire front face panel of the enclosure. Confirm location in field.

5. Major components shall be plugged in using WAGO terminal blocks for ease of installation and replacement. Unit shall be designed to activate a 24-volt AC solenoid valve.

6. Provide a make-up water solenoid valve, normally closed, stainless steel fitted, bronze body, 24 VAC slow closing type. Size to pipe. Interlock with automatic water level control system. Refer to the Drawings for additional information. Such as ASCO, or approved equal.

7. Discharge of make-up water shall be into a fill standpipe and piping to the Dive Pool and Competition Pool surge tanks. Refer to the Drawings for additional information.

2.10 INSERTS AND ANCHOR SOCKETS

A. Sockets and anchors shall be provided as stainless steel or cast bronze for swimming pool accessories. The CONTRACTOR shall confirm compatibility of deck equipment and deck anchors with the deck equipment manufacturer. All anchors or sockets shall be provided with flush closure caps and escutcheons with set screws where indicated. Escutcheons shall be of the keyhole or oblong shape, similar to the casted, electro-polished stainless steel escutcheon with set screw by Paragon #28303SS, or approved equal.

1. Anchor sockets for all railings and grab rails shall be of the wedge type, cast bronze, 4 inches in depth and made to receive 1.50 inch OD tubing as manufactured by Paragon #28105, or approved equal. The wedge shall be cast bronze, incorporate a stainless steel tightening bolt and flat washer, and be designed as the sacrificial element to the anchor system. All metallic components shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance.

2. Anchor sockets for all stanchions shall be of cast bronze, sized to receive a full 6 inches penetration of 1.900 inch OD tubing as manufactured by Paragon Aquatics Catalog No. 38201TC, Spectrum Products No. 23626, Kiefer No. 700103, or approved equal. Each anchor socket is to be provided with a flush threaded, vandal proof closure cap Paragon Aquatics Catalog No. 38201TC or Spectrum Products No. 23628, or Kiefer No. 700103C, and a grounding lug with screw. Provide Paragon Aquatics catalog no. 38303, Spectrum Products catalog no. 23630, Kiefer No. 700103K, or approved equal spanner wrenches for removing the closure cap.

3. Cup anchors for racing lane lines, water polo tether and boundary lines etc. shall be incorporated into the perimeter overflow system. Cup anchors shall be 316L stainless steel with stainless steel threaded eyebolts. The heavy-duty cup anchors shall be 3-3/8” in diameter. Cup anchors shall be Spectrum round cup anchor, part no. 58316, SR Smith Lane Line Wall Anchor, part no. WA-100, or approved equal.

4. Anchors sockets for single post starting platforms located on the deck level, rollout, parapet and bulkheads shall be designed to prevent rocking. NOTE THAT STARTING PLATFORMS SHALL BE DESIGNED TO BE INTERCHANGEABLE BETWEEN ALL POOL EDGE CONDITIONS, INCLUDING BULKHEAD, REQUIRING DIFFERENT ANCHOR SOCKET DEPTHS FOR INSTALLATION AT EACH EDGE CONDITION TO MAINTAIN PROPER PLATFORM HEIGHT ABOVE WATER LEVEL – REFER TO PLANS. A stainless steel cap shall be provided to flush mount on the deck when platform is removed. Anchors for starting platforms shall be by the starting block manufacturer - SR Smith Rock Solid anchor is required by Owner.

5. Anchor assembly for pool lift shall be supplied by the pool lift manufacturer and shall include a grounding lug for proper bonding. Install in accordance with manufacturer's instructions and provide the concrete foundation reinforcing required to properly anchor and support the unit for its intended use. Manufacturer shall provide an anchor that has a completely flush cover or flush plug for times when the lift is not in use.

6. Anchors for the diving board stands shall be all bronze threaded castings for respective 5/8” threaded anchor bolts. The stand shall be designed for mounting with the use of Durafirm catalog number 70-231-900 bronze deck anchors.

7. Anchors for bulkhead locations shall be provided by the bulkhead manufacturer and installed into the gutter system by the CONTRACTOR where shown on drawings.

2.11 DECK EQUIPMENT

A. Grab rails shall be provided as required in the quantities and to the dimensions as shown on the drawings. Grab rails shall be fabricated of one continuous length of polished and buffed tubing. The tubing shall be ASTM-A-554 grade 316L stainless steel, 1.50 inch OD x .120 inch minimum wall thickness, polished and buffed to 320 grit finish and shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. All bends shall be smooth and free of wrinkles. Grab rails shall be pretzel bend style with dimensions as indicated in the plans and as manufactured by Spectrum, SR Smith, Paragon, or approved equal.

B. Railings for the diving tower and springboard pedestals shall be provided as detailed on the architectural drawings. Rails shall be custom fabricated of one continuous length of tubing wherever possible. The tubing shall be Anodized Type 6061-T6 Schedule 40 Aluminum, 1.50-inch OD x .120 inch wall thickness – A31 Architectural Class II Clear Anodize, or as specified by Architect. All rails shall be vented for Anodizing. All welding shall be in accordance with American Welding Society Code D1.1-94. Welding electrodes shall be Aluminum 5356. Welding slags, burrs and splatter shall be removed from hand rail surfaces and all exposed welds shall be ground smooth. All dimensions shall be field verified prior to fabrication.

C. Stanchion posts (backstroke and false start) shall be provided as required and in the quantities shown on the drawings. The posts shall be a straight length of type 316L stainless steel tubing, 1.900 in. OD x .145 in. wall thickness x 8 ft. 0 in. overall length, polished and buffed to 320 grit finish. Stanchions shall be capped at one end with a closure plug containing a U-shaped hook and fitted with a stainless steel eyebolt attached to an adjustable nickel plated bronze sliding collar. Stanchion shall be as manufactured by Paragon Aquatics, catalog no. 38106, or Spectrum Products catalog no. 23614 with Paragon Aquatics catalog no. 38301 or Spectrum Products catalog no. 23625, sliding collar, with eyebolt or approved equal.

D. Starting Platforms

1. Single post starting platforms for the rollout/parapet/bulkhead (19 required, 18 plus 1 spare) shall have number plates on both sides numbered 1 through 18. Spare block shall not be numbered. Platform block height shall be 29-1/2” inch above water level. The platform top (24” wide x 32” deep) and intermediate side step (8” x 12”) shall be constructed of fiberglass. Contractor shall confirm step is on correct side (right or left) according to plans. The top shall be permanently positioned at a 10° tilt towards the pool. Frames to be 2.5 square inch x .125 inch wall thickness 304 stainless steel tubing with a powder coated finish. Architect/Owner to select colors. Verify height of platform above water before ordering. Backstroke bar shall be 1” diameter and allow both horizontal and vertical grab positions. Blocks shall have raised side grip handles and adjustable back plate. Platforms shall be custom blocks as detailed on the plans. Blocks shall be SR Smith Velocity single post starting platforms as required by Owner. Each starting platform shall have two labels affixed stating "Warning-Execute Shallow Racing Dive - Impact with Pool Bottom can Cause Permanent Injury." NOTE THAT STARTING PLATFORMS SHALL BE DESIGNED TO BE INTERCHANGEABLE BETWEEN ALL POOL EDGE CONDITIONS, INCLUDING BULKHEAD, REQUIRING DIFFERENT ANCHOR SOCKETS DEPTHS FOR INSTALLATION AT EACH EDGE CONDITION TO MAINTAIN PROPER PLATFORM HEIGHT ABOVE WATER LEVEL – REFER TO PLANS

2. Starting platform safety covers (18 required) are designed to keep unwanted users off stating platforms. The cover is made of 1/16” thick tough, lightweight plastic with a UV stabilizer and fits 20” x 24” platform tops. The conical shape and safety orange color act as a deterrent of stating platform use. Each cover is provided with a bungee cord for securing cover platform top.

E. Backstroke Start Assist Device

1. The Backstroke Start Device (eight (8) required) shall provide swimmers with an automatically retracting foot wedge to be used to aide backstroke starts. The backstroke start device shall offer multiple anchoring options to accommodate a variety of deck and block profiles. Backstroke Start Device shall be as manufactured by Spectrum Products, or approved equal.

2. Structure: The backstroke start device frame shall be fabricated from 12 ga 316L stainless steel material. This frame shall provide the structure for the multiple anchoring options of the unit. The frame shall contain the strap and retraction systems of the device.

3. Wedge: The wedge shall be constructed of an injection molded glass reinforced polypropylene copolymer. The wedge shall have the following dimensions: 8cm height 2cm width at the bottom edge 10° sloping face and 0.5cm radius along the upper edge. The wedge shall have a molded non slip surface for contact with the swimmers feet. This surface shall be easy to clean.

4. Cover: The internal workings of the unit shall be enclosed by a molded acrylic polyvinyl chloride. The cover material shall be UV resistant.

5. Mounting System: Each Backstroke Start Device shall include a standard strap mounting plate and straps. This attachment shall accommodate mounting in standard single and dual post starting platforms with a setback up to 36".

6. Retraction System: The backstroke start device shall retract the wedge from the pool upon the swimmer's start. The device shall have a ratchet system preventing unintentional downward displacement of the wedge during the swimmers start.

F. Dive Harness System (Three (3) required)

1. Provide a complete dive harness spotting system for one 3-meter and one 1-meter springboard as indicated in the plans. Dive harness system and all components shall be as supplied by Springboards And More (877-348-3246) www.springboardsandmore.com, or approved equal.

2. Beam Clamps: Provide beam clamps as required for attachment to natatorium structure overhead. Clamps shall be sized as appropriate for mounting to the welded flange at tube steel (refer to structural) and shall be constructed entirely from heavy-gauge cold-rolled steel provided with a corrosion resistant factory powder coat finish. Two (2) clamps required per dive harness.

3. Pulleys: Provide single and double pulleys designed for use with diving harness equipment. These pulleys shall have a strong swivel mechanism attached at the top that allows spotting equipment to move effortlessly. Pulleys shall be constructed of grade 316 stainless steel load straps and cheeks, and anodized aluminum sheaves that run on a self-lubricating Oilite Bronze bearing. The single pulleys shall have a maximum working load of 1,000 lbs. and a break load of 10,000 lbs. The double pulleys shall have a maximum working load of 1,200 lbs. and a break load of 12,000 lbs. Single pulleys shall be "RSI 3 Inch Single Rescue Pulley" and double pulleys shall be "RSI 3 Inch Double Rescue Pulley" as provided by Springboards And More or approved equal.

4. Spotting Rope: Provide 9.5mm spotting rope where shown on the drawings. Spotting rope shall be of kernmantle construction, and designed for low elongation. Spotting rope shall have a nylon or polyester 16-strand sheath combined with a Type Six double-twist continuous strand core to provide high tensile strength. Core strands shall have opposing twists to prevent unnecessary spinning. Spotting rope shall be "Blue Water Static Kernmantle Spotting Rope" as provided by Springboards And More or approved equal.

5. Spotting Belt: Provide one (1) adjustable spotting belt per dive harness assembly. The belting, hardware, and fabrics of the spotting belt shall be designed for use in water. The spotting belt shall have parachute webbing and cast steel hardware. The buckles shall be non-slip, cinch-type. Two (2) 4 ft nylon webbing straps with swivel belt clips shall be provided. The belt shall be adjustable for waist sizes 24" to 32". Adjustable spotting belt shall be "AAI Padded Adjustable Tumbling Belt" as provided by Springboards And More or approved equal.

6. Twisting Belt: Provide one (1) twisting belt per dive harness assembly. The twisting belt shall be designed for use in water. The rotating rings shall be cast of high tensile strength aircraft aluminum alloy. Inner belts shall be made of high strength nylon parachute webbing and open from both the front and back for quick-fit adjustments. High strength, cinch-type buckles shall be made of forged steel designed for use in parachute harnesses. Two (2) 4 ft nylon webbing straps with swivel belt clips shall be provided. Twisting belt shall be "AAI Padded Twisting Belt" as provided by Springboards And More or approved equal.

7. Nylon Boat Cleat: Provide two (2) nylon boat cleats for dive harness concealment. The boat cleat will provide a tie-down point for the dive harness spotting rope (9.5mm) on each side of the pool. Each boat cleat shall be located at a height of seven (7) feet above the finished pool deck. The boat cleat shall be 4" in length designed to support 3/8" line. Construction shall be injection molded, open base, glass-filled nylon with two mounting holes. Mounting hardware shall be stainless steel.

G. Water Polo Goals

1. Goals shall be constructed to meet all official regulations of FINA, NCAA, NFSHSA, and USWP. Where a conflict exists between these specifications and the official regulations of FINA, FINA shall govern. Special finishes and backings shall comply with the regulations. Deck-mounted water polo goals shall be adjustable vertically to provide the regulation cross bar elevation in shallow or deep water.

2. Floating water polo goal (6 required) shall consist of a front frame made of non-corrodible 3 inch x 2 inch aluminum with rounded edges and supported by 1 ¼" non-corrodible polished pipe. The flotation unit shall be vacuum formed ABS plastic supported by high-density ethafoam. The floating goal shall be as manufactured by Anti-Wave Club, Anti-Wave Odyssey, Kiefer KAP204, Kiefer WPG1402, or approved equal. The goal shall be provided with mesh netting securely fastened to the cage. Goal shall incorporate attachments for wave quelling cable floats, hooks and take-up ratchet for securing to rope anchors.

H. Lifeguard Chairs

1. Lifeguard chairs shall be constructed of UV inhibited recycled HDPE chairs. Seat height shall be 48" and 66" above the pool deck. All joints shall be secured using T- 316L stainless steel screws. Refer to architect for color finish.

   a. Lifeguard chairs (6 required) shall be Spectrum Mendota #45023, Tailwind Furniture model no. LG510, Kiefer Forever Guard Chair model no. 500231, SR Smith Sentry #SLGC42, or approved equal.

   b. Tall Lifeguard chairs (3 required) shall be Spectrum Mendota #45023, Tailwind Furniture model no. LG510, Kiefer Forever Guard Chair model no. 500231, SR Smith Sentry #SLGC42, or approved equal.

I. Diving Stands

1. Diving stands for the one-meter/three-meter springboards shall be installed as shown on the plans. The diving board stand shall consist of heavy aluminum castings dipped in erudite chromic acid solution, followed by a 20 mil coat of baked epoxy. Finish must be touched up in the field if damaged in shipping or assembly. The roller tube and tracks shall be heat-treated extruded aluminum processed by Alcoa Duranodic hard anodizing process. The bearings for the roller tube and slide shall be nylon with grease fittings, adjustable and field replaceable. The diving board anchor hinges and pins shall be heat treated aluminum forgings with a design tensile strength of 35,000 psi and shall receive Alcoa Duranodic hard anodizing. Hinges shall be designed to allow 180-deg. rotation of the diving board to the rear of the stand. Hinges shall be mounted on a transverse casting machined to allow 7 leveling positions in one-inch increments. The diving board anchor bolts shall be 5/8-inch diameter by 3-1/2 inch long silicon bronze. Fulcrum shall have an adjusting wheel at one end that can be turned by hand or foot. Diving stands to be as manufactured by Duraflex International Corp.

   a. Short stand (4 required) shall be Durafirm catalog #70-231-524 and included with six (6) bronze deck anchors, Durafirm catalog #70-231-900.

J. Diving boards (4 required) shall be an aluminum extrusion type springboard. The diving boards shall be a Maxi-Flex Model "B" diving board as manufactured by Duraflex International, Inc., model #66-231-330 or approved equal. The diving board shall be 16 ft long and 19-5/8 inches wide. The top surface shall be finished with three coats combined with a mixture of sand and white aluminum oxide to affect the non-skid surface with 200 perforations.

K. Surge tank access hatch (2 required) shall be provided as shown on the drawings. The access hatch shall be a single door 3 ft.-2 in. x 2 ft.6 in with 1" fillable pan to receive ceramic tile and grout or concrete fill to match the surrounding deck. The frame shall be ¼ inch extruded aluminum with built in neoprene cushion and continuous anchor flange. Door shall be ¼" aluminum plate reinforced with aluminum stiffeners as required. Door shall be equipped with heavy continuous stainless steel hinges and shall have compression spring operators for easy operation. Door shall open to 90 degrees and lock automatically in that position. Door shall be built to withstand a live load of 150 lbs. per square foot and equipped with a continuous Type 316L stainless steel hinge, tubular type, and an automatic hold open arm with release handle. All hardware is to be type 316L, 18-8, stainless steel. A flush lift handle and a snap lock with removable key wrench shall be provided. Factory finish shall be mill finish with bituminous coating applied to the exterior of the frame. The access door shall be Type TER-3 single leaf pan type door as manufactured by the Bilco Company.

L. Surge tank and backwash catch basin ladder rungs shall be ½ inch Grade 60 steel encased with co-polymer polypropylene plastic as manufactured by M.A. Industries, Inc, phone 770-487-7761.

M. Pool Lift

1. Pool lift at dive pool (1 required) shall be a battery powered handicap lift with footrest assembly. Lift shall comply with the Americans with Disabilities Act Access Guidelines (ADAAG), be capable of lifting 400 lbs, and shall include a stainless steel anchor socket, cover, spanner key, and a seat belt assembly. The following accessories shall also be provided: caddy, arm rest assembly, lift cover, stability vest, extra battery, wired controls, and spineboard attachment. All stainless steel components shall be 304L. Lift to be a Splash Aquatic Lift, model #300-0000, manufactured by S.R. Smith, the Motion Trek BP 400 model #163145, manufactured by Spectrum Products, or approved equal. Contractor to confirm pool lift fits on pool perimeter and operates correctly.

2. Pool lift at competition pool (2 required) shall be a battery powered handicap lift with footrest assembly. Lift shall comply with the Americans with Disabilities Act Access Guidelines (ADAAG), be capable of lifting 400 lbs, and shall include a stainless steel anchor socket, cover, spanner key, and a seat belt assembly. The following accessories shall also be provided: caddy, arm rest assembly, lift cover, stability vest, extra battery, wired controls, and spineboard attachment. All stainless steel components shall be 304L. Lift to be a Splash Extended Reach Aquatic Lift, model #370-0000, manufactured by S.R. Smith, the Motion Trek BP 400 model #163145, manufactured by Spectrum Products, or approved equal. Contractor to confirm pool lift fits on pool perimeter and operates correctly.

N. Provided a ship's ladder in the size and shape shown on the drawings. Ladder shall be aluminum with aluminum stiffeners if required by OSHA. CONTRACTOR shall provide ladder to general contractor for installation. Refer to the Architect.

2.12 LOOSE EQUIPMENT

A. Competition floating lane ropes shall be as shown on the drawings and described in these specifications. Floating lane ropes shall be a non-turbulent type with wave quelling floats and 3/16" stainless steel coated cable. Floats shall be injection-molded polyethylene. Colors to alternate the length of the pool with a contrasting solid color for the final 15 feet/16 feet 5 inches (Architect/Owner to select colors). All floating lane ropes shall be provided as completely assembled and installed with take up reel, type 304 stainless steel spring and cable lock, hooks, and wrench. 5/8" wrench shall be made of a forged steel shaft with a polished chrome finish. The take up reel shall be constructed of type 304 stainless steel. The spool shall be a bronze nickel-plated casting with a nylon sleeve. Floating lane ropes shall be similar to Competitor Swim Products, Competitor Gold Medal 6" Racing Lanes, Kiefer Advantage II (6") Racing Lanes, or Anti-Wave Maximum (6") Racing Lanes, pre-assembled and sized to fit the length of the pool. Provide Competitor lane rope extension hooks as detailed on the drawings complete with protective sleeve for the competition pool. Floating lane ropes with disconnects for shorter distance are acceptable for conversion between 25-yards and 25-meters. 50-meter lane ropes shall be continuous sections without disconnects. Provide contrasting disks located 15 meters from each end to meet resurfacing requirement. This requirement shall be met for each possible course length.

Quantities:
Competition Pool: Provide 22 at 25 yards with disconnects for 25 meters

	Provide 18 disconnect extensions for conversion to 25 meters
	Provide 9 at 50 meters (continuous length)
	Provide 12 additional extension hooks
Dive Pool	Provide 5 at 25 yards for deck level gutter

B. Water polo floating ropes shall be as shown on the drawings and described in these specifications. Floating ropes shall be a non-turbulent type with wave quelling floats and 3/16" stainless steel coated cable. Floats shall be injection-molded polyethylene. All floating ropes shall be provided as completely assembled and installed with take up reel, type 304 stainless steel spring and cable lock, hooks, and wrench. Water polo floating ropes shall be pre-assembled and sized to fit the length of the water polo course. Provide extension hooks as detailed on the drawings complete with protective sleeve. Floats shall be colored per NCAA and FINA guidelines for each water polo course as shown on the drawings and listed below. Water polo floating ropes shall be similar to Competitor Swim Products Water Polo Rink, Anti-Wave Water Polo Course Ropes, Kiefer Advantage Water Polo Course Markings, or approved equal.

Colors:

Goal Line	White
2 Meter Line	Red
5 Meter Line	Yellow
Half Distance Line	White

Quantities:

Competition Pool:	Provide a complete set of boundary ropes for FINA/NCAA water polo field of play (disconnects for men and women fields of play are acceptable)
	Provide 6 boundary ropes for cross course water polo field of play
	Provide four (4) goal tether ropes with 4" white disks for each goal with a FINA/NCAA field of play. Two (2) tether ropes for each goal shall include 2 meters long x 1.08 meters wide area of solid red disks to identify the re-entry area per FINA WP1.2 field of play diagram.

C. Water Polo Floating Ball Release

1. For pools with floor anchors, the water polo floating ball release device shall be shown on the drawings and described in these specifications. The release device shall be anchored to the pool floor in the center of the water polo half distance line using two (2) 316L stainless steel eyebolts, inserted in 316L stainless steel sleeves. The water polo floating release device shall be made of high quality plastic or PVC construction and securely fastened to a pull cord. The water polo floating release device shall be Aquam WP-75995 or approved equal.

D. Water polo ejection board shall be shown on the drawings and described in these specifications. The ejection board shall be capable of displaying both teams' cap numbers, the number of ejections per cap number, and each team's remaining time outs. The board shall be ¼" aluminum material with attached acrylic tracks that fit 2" high quick change letters and colored circles. The ejection board shall be securely attached to a wall or attached to a moveable stand. The ejection board shall be custom made by All Star Record Boards, call (814) 725-5834, or approved equal.

E. Backstroke flags:

1. Backstroke flags shall be made of Nylon material, triangular in shape (12" wide x 17" long), and alternating in color, and sewn onto a Nylon tape. Additional tape shall be provided at both ends for fastening to the stanchions. Submit samples for review and approval. Equipment shall be Kiefer Nylon Backstroke Flags, #600120, or approved equal. Provide backstroke flags with team/school name/logo on one side and lane identification on the other. Coordinate logo with Architect.

F. Recall rope shall be 1/2 inch yellow polypropylene rope complete with weight rings and two quick snap connectors made of chrome-plated brass. The rope shall consist of a neco plate constructed of soft aluminum that is crimped and used to connect the two pieces of rope to form the required loops. Recall rope shall be Recreonics, catalog no. 92-967 for an 8 lane pool.

G. Lane rope storage reels shall be fabricated from two powder-coated enclosed aluminum wheels joined together by a 1-1/4 inch aluminum axle. This unit must ride easily on four 6" stainless steel casters with individual brakes. The reel shall have a collapsible tow handle for safe movability. The storage reel should be able to hold 902' of 4" lane ropes or 492' of 6" lane ropes. The CONTRACTOR is responsible for assembly. The correct number of storage reels shall be provided to store all floating lane lines. Lane line storage reel to be Competitor Swim Products Elite Stor Lane Reel, Catalog #200 850 with Competitor storage reel cover, catalog #200 861, or approved equal.

H. Hanging nets (2 required) shall be provided to span the width of the pool to divide various areas of the pool and / or protect the interior walls of the natatorium during water polo. Nets and harness system shall be mounted to stanchions anchored in the movable stanchion anchors. Nets to be heavy duty knotless nylon. Nets to be located on the bulkheads.

I. T-wrench for operation of valve extensions shall be fabricated of ¾" diameter SCH 40 stainless steel pipe. The T-wrench shall be 4'-0" in length with a 24" long welded "T" handle. The wrench shall be fitted with a ¾" square stainless steel male end, 1" in length, for operation of valve extensions at the surge tank. Two complete T-wrenches shall be provided.

2.13 MAINTENANCE EQUIPMENT

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Wall brush (4 required) - Brush backing shall be a flexible polyethylene material with five (5) rows of nylon bristles. Pool brush holder shall be permanent mold cast aluminum with hydrofoil flap. Holder shall have stainless steel screws to facilitate brush changes. Handle bracket shall be quick detachable mount to fit standard 1 ¼ or 1 ½ inch diameter handles. Brush to be Recreonics no. 10-135, Lincoln Aquatics 31-020, or approved equal.

2. Skimming net (4 required) - Skimmer head shall consist of one-piece molded plastic frame with a reinforced, integral handle bracket suitable for quick attachment to a standard 1¼ or 1 ½ inch diameter handle using bolts and wing nut. The standard nylon net shall be attached to the frame using the groove and spline method. Net depth shall be 4 inches minimum in the center. Skimmer net shall be manufactured by Skimlife No. SS8, or approved equal.

3. Telescopic Poles (4 required) - Cleaning tool handle shall be of the telescopic design and fabricated from corrosion resistant, high-quality anodized aluminum. Poles shall be fully adjustable, to desired length, with a simple twist of a cycolac threaded locking device. Poles shall consist of a 1 inch tube fitted inside a 1¼ inch tube and be adjustable from a range of 8 ft. to 16 ft. Handle shall be adjustable from 8 ft. to approximately 16 ft. having a threaded bushing type clamp to lock handle at desired position. Poles shall be manufactured by Pool King, or approved equal.

4. Portable Vacuum Poles

   a. Telescopic poles fiberglass poles (3 required) - Vacuum head attachment poles are to have a super-tough 1¼ inch fiberglass handle. Poles are to be 8 ft. each, totaling a 24 ft. length for vacuum head attachment. Poles are to be Recreonics No. 10-370 with quick change adapter Recreonics no. 10-374 or approved equal.

5. Test Kits

   a. Provide two (2) test kits

      1) The first test kit shall feature liquid reagents, color comparator, waterproof instructions and treatment charts, chemistry guide and water gram. Test kit to have the ability to test for free and total chlorine (0.5 – 5.0 ppm), bromine (1-10 ppm), pH (7.0 – 8.0), acid and base demand, total alkalinity, calcium hardness and cyanuric acid. Test kit shall be Taylor Complete 2005 test kit, or approved equal.

2) The second test kit shall be photometric and utilize tablet reagents for stability that will allow accurate measurement of free and total chlorine (0-10 ppm), bromine, pH, alkalinity, calcium hardness, and cyanuric acid. The test kit shall have solid-state digital electronics and built-in filters. The test kit shall be direct-reading with automatic blank settings, automatic power cut-off, and store the last 10 results in nonvolatile memory. Test kit shall be a Pooltest 6 system based on the Palintest system of water analysis. Provide SPH 006D Pooltest 6 - Hard Carry Case Kit and SPC 006 Check Standard or AquaPRO 6 Test Kit manufactured by Orbeco-Hellige Inc. and Reference Standard Kit (LP275680).

6. Vacuum Cleaner

a. Vacuum cleaner (filtered water return to pool) - (1 required) to be complete with a 36 inch dual manifold head with 75 feet of 1-1/2 inch floating hose. Hose to be Recreonics, catalog no. 10-429, Lincoln Aquatics no. 29-065 or approved equal. 24 ft. stainless steel pole shall be available for attachment. The portable cartridge vacuum cleaner system shall include a 155 square foot T-316 stainless steel up-flow single cartridge filter, a 1 HP self-priming thermoplastic self-priming pump 1-1/2 inch suction and discharge connection and 110 cubic inch strainer capacity. Cartridge shall be Harmsco no. ST/155 or approved equal. The system shall be provided with one spare cartridge filter. The pump motor shall be 115 volt single phase, 60-cycle, open-drip proof and shall be UL and NSF listed. The pump motor shall be provided with a 120-volt Hubbell switch, weather proof switch cover, in-line pre-wired GFCI and a 100' power cord. The cord shall be wired to a 20 amp, 115/230 volt switch which shall be mounted on pump motor. All interconnecting pipe and fittings shall be schedule 40 PVC. The entire assembly shall be bolted to a T-316 stainless steel cart and shall have pneumatic wheels with grease fittings and roller bearing hubs. Unit to be Recreonics, catalog no. 10-806, Lincoln Aquatics no. 27-010, or approved equal. Accessories shall include a 1-1/2 inch x 25 ft. discharge hose with stainless steel hose clamp. Hose to be manufactured by Quaker Plastic Corporation no. QT-131, or approved equal.

7. Robotic Pool Cleaner

a. DuraMax Robotic Pool Cleaner

1) Provide one (1) dual motor driven automatic swimming pool vacuum device. Cleaner weighs 49 lbs and has internal water-cooled brushless drive motor with automatic program to clean the pool floor and walls, travelling 1¼ ft per second, scrubbing pool surfaces with onboard rubber brushes and two power-washing jets. Two separate internal oil-cooled, water-cooled, brushless pump motors filter 9,600 GPH, vacuuming a 3 ft wide path using four offset 5½ square inch suction inlets underneath, filtering fine debris <10 microns small and solids as large as 1½ inch into two internal reusable filter bags. Solid ½" 316 stainless steel axles extend the length of the cleaner connecting to a commercial-grade drive-train with Kevlar reinforced drive belts. Stainless steel reinforced side plates are capped with soft gray tracking wheels for durability and corner and curve tracking agility. Unit complete with remote control, air sensor, UltraKart, 120 ft cord, set of SK3016BL deep clean super brushes (for most surfaces), 2 filter bags, digital timer, power supply with 24 volt transformer, 1 hour cleaning cycle delay option, operator manual. Requires 110 volt GFCI receptacle onsite, consumes 5 amps electricity. The pool cleaner shall be a DuraMax Duo as manufactured by Aqua Products, Inc., or approved equal. Include with 120 ft cord/150 ft cord optional. Optional standard or raised high infrared (if needed to detect large obstacles or bulkheads).

8. Stainless Steel Cleaner - Provide a stainless steel cleaner. The cleaner shall comprise of one (1) gallon of organic passivation solution. It shall be complete with instructions for proper maintenance of stainless steel surfaces and material safety data sheets for the passivation solution. The cleaner shall be the Spectra-Clean System 2 as manufactured by Spectrum Products. Product to be applied with 3M scouring pad, or equivalent.

2.14 SAFETY EQUIPMENT

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Ring buoy and extension rope (7 required) – Buoy shall be 24 inch diameter vinyl clad PVC foam with a metal ring molded inside. Buoy shall have a 3/8 inch polyethylene rope attached to it at four points and be a minimum 60 feet in length. Preserver shall be U.S.C.G. approved. Buoy and rope to be mounted at each lifeguard chair on hooks. Ring buoy to be manufactured by Cal-June no. G-24-WH or approved equal. Throw rope to be Recreonics no. 12-261, Lincoln Aquatics No. 42-050, or approved equal.

2. Life hook and fiberglass pole (7 required) - Life hook shall be an anodized aluminum 3/8 inch OD "shepherd's crook" with a 1-1/8-inch OD handle attachment suitable for a 1¼-inch 16 ft. fiberglass extension pole. Each life hook shall be provided with a separate 16 ft pole. Hook shall be of looped construction. Each pole to be provided with a set of spring type stainless steel pole clamps for mounting on each lifeguard chair. Life hook shall be manufactured by Rainbow no. 153, or approved equal. Pole clamps shall be Recreonics no. 10-353, or approved equal, and fiberglass poles shall be equal to Recreonics no. 10-372.

3. Spineboards (2 required) - Spineboard shall be 72” long x 20” wide, constructed of 100% virgin high density polyethylene. The design shall provide stiffness and torsional rigidity while remaining lightweight. The spineboard shall accommodate up to 500 lbs and shall feature customizable buoyancy that allows users to adjust the buoyancy by inserting polyethylene foam rods (supplied with the spineboard). There shall be (10) handholds around the perimeter of the board. The spineboard shall be supplied with one (1) 2-piece head immobilizer, one (1) head strap, four (4) body straps, one (1) head immobilizer with head bed, and two (2) flotation rods. The spineboard shall be CJ Rescue 6 package as manufactured by CJ spineboard at 1-206-824-8886 or approved equal. The CONTRACTOR shall provide one (1) set of heavy duty stainless steel utility hooks per spineboard for storing the spineboard at a convenient and readily accessible location near the pool (Recreonics catalog no. 10-362).

4. First aid kit (2 required) - First aid kit shall be a 24 unit kit per American Red Cross standards as manufactured by Swift First Aid, or approved equal.

5. Rescue tube (12 required) - Provide one rescue tube for each lifeguard chair. Rescue tube to be Recreonics No. 12-303, or approved equal.

6. Safety eyewash station (2 required) - Safety eyewash station shall be a self-contained system in which eyewash bottles are securely positioned in a portable holder. Eyewash bottles shall be 32 ounces and easily removable from case, and shall contain a sterile, saline solution with the ability to neutralize a varying quantity acids or caustics. Eyewash stations shall be equipped with a double back screw and holes for easy mounting in location to be determined by the Architect. Stations shall be Recreonics 12-033, Lincoln Aquatics 49-026, or approved equal.

7. Safety eyeglasses - Provided a safety eyeglass dispenser station containing ten (10) pairs of safety glasses. Eyeglasses shall be ANSI/OSHA accepted, and be equal to Lab Safety Supply Inc. (1-800-356-0783) no. WQ-14740B.

8. Bag Valve Masks – Provide two (2) bag valve mask assistant resuscitation systems, one size Adult (1500ml tidal volume) and one size Infant/Child (450ml tidal volume). Product shall be a latex free disposable bag mask unit with support strap, transparent patient valve, and textured surface to eliminate slipping. Integral swivel valve, available with a closed reservoir system. Standard pack includes resuscitator, oxygen reservoir and a transparent bag for storage. Bag Valve Masks shall be Ambu SPUR II, or approved equal.

9. AED – Provide one (1) Automated External Defibrillator and one (1) trainer AED corresponding to the chosen AED per facility level for the aquatic facility. Product location shall be coordinated with the Owner and Architect. AED shall be Recreonics No. 12-430, Lincoln Aquatics No. 48-013, or approved equal and must have an available training AED device. AED Cabinet shall be Recreonics No. 12-434, Lincoln Aquatics No. 48-023, or approved equal.

2.15 THERMOMETERS

A. The following items are to be supplied by the CONTRACTOR unless otherwise noted. All proprietary names are to designate performance only. Equal products will be accepted.

1. Portable thermometer (3 required) shall be a molded ABS plastic tube body type with the ability to measure temperature in both degrees Fahrenheit and Celsius. A 3 ft. polyethylene cord is to be attached to thermometer. Thermometer is to be manufactured by Pac-Fab/Rainbow no. R141036 or approved equal.

2. Inline thermometer to be near the heating loop and shall have a 9 inch adjustable angle with a minimum 6 inch stem. There shall be a minimum of two (2) thermometers per loop, and must have ability to read temperature in both degrees Fahrenheit and Celsius. Thermometers are to be Recreonics no. 32-702, Lincoln Aquatics no. 21-125, or approved equal.

2.16 SWIMMING POOL FINISHES

A. Paint

1. Scope shall consist of the complete competition and dive pool gutter trough interiors, including the underside of parapet on the competition pool.

2. Coating shall be a low VOC compliant polyamidoamine epoxy suitable for chlorinated water below 3.2 ppm for installation on concrete surfaces. CONTRACTOR shall provide on-site technical services and approval from the coating manufacturer prior to application and during the coating application. Coating shall be Tnemec Series 161HS, Induron Perma-Clean II Semi-Gloss or approved equal. Color shall be white.

3. Surface Preparation

a. Cast-In-Place Concrete

1) Allow concrete to cure a minimum of 28 days at 60 deg. F. Brush-off pool interior surfaces, then blast clean to remove laitance and weak surface concrete to produce an anchor profile similar to medium grade sandpaper referencing SSPC-SP13/NACE 6, ICRI-CSP 2-4 Surface Preparation of Concrete. Blasting shall open up surface voids, holes and irregularities. No holes or holidays in the paint membrane will be allowed. Fill with an approved grout or Tnemec Series 215 Surfacing Epoxy, or Induron EFS707 Epoxy Surfacer and Filler, any hole or irregularity that cannot be satisfactorily painted. Do not entirely remove the surface or completely expose underlying aggregate. After blasting, neutralize concrete with a solution of 2 cups aqua ammonia per 5 gallons of water. Flush with clean water and allow to thoroughly dry.

4. Application Procedures

a. Before applying any material, measure and record the temperature and relative humidity. Apply only if temperature is above 55 deg. F. and at no lower temperature than 5 deg. F. above the dew point. Do not apply when the relative humidity is greater than 85%. If possible, plan the painting schedule so that all painting is done in the coolest part of the day. Provide proper ventilation so that paint fumes do not become concentrated.

5. Application of the Primer

a. After the pool surface has been thoroughly dried and cleaned the primer coat can be applied. Surface spreading rate shall be observed as not to exceed the recommended manufacturer's rate of application. The primer will be applied at a minimum rate of 200 SF per gallon and shall conform to local VOC requirements. A good heavy coat shall be applied. A rough or porous concrete pool will require more paint than recommended. On particularly rough surfaces two coats are recommended in order to provide a smooth, uniform finish. Note: Any marks or irregularities that show through the primer will also be apparent when the finish coat is applied.

6. Application will be made by brush, roll, lambs wool applicator, or spray. When the finish coat is to be a color other than white the primer will be tinted.

7. Application of the Finish

a. After the primer is dry enough to walk on without removing or marking surface, apply the finish coat(s) in accordance with the manufacturer's instructions. Application shall be done by the use of a brush, roller, lamb's wool applicator, or spray methods at a rate of 150-250 SF per gallon. Allow a minimum of 5 hours (at 75 deg. F) drying time between coats. Two coats of finish paint are recommended to improve upon general appearance of pool shell. Allow 7 days curing (at 77 deg. F.) before filling the pool.

8. Application of pool striping, depth markings, warning signs and wall targets, shall be done after final coat of finish paint has cured for at least 24 hours.

9. Slip resistant additive shall be applied to the all outdoor areas, entry steps, ramp areas, zero entry and all deck markings.

10. Final paint coating shall be allowed to dry a minimum of 7 days at 35 degree Fahrenheit or above, before filling the pool.

B. Pool Cementitious Finish – Reference specification section 131104, Swimming Pool Cementitious Finish.

C. Pool Tile – Reference specification section 131103, Swimming Pool Tile.

2.17 WATERPROOFING

A. Products

1. Interior surfaces of Surge Tank, Backwash Pit with NO additional finishes: Apply two (2) coats of BB White from Vandex, Modify or Megamix I from Xypex, or Plainseal 88 from Mapei, directly to surface of surge tank and backwash pit.

B. Surface Preparation

1. Surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion. Surfaces shall be roughened by sand blasting, water jetting, shot blasting, scarifying, or grinding. Surface defects or holes shall be patched per manufacturer's recommendations.

C. Application

1. Do not apply materials under conditions where the ambient air temperature is less than 40 degrees Fahrenheit, or to a frozen substrate.

2. All mixing of products, quantities and application procedures shall be done in accordance with the manufacturer's recommendations.

2.18 SEALANTS

A. Provide sealed expansion joints as shown on the pool and pool structural drawings or noted on the Contractor's construction/expansion joint layout, and as required. Expansion joints shall be constructed and sealed as indicated and in accordance with the manufacturer's recommendation. Sealant to be manufactured by LATICRETE International, Inc., Mapei, or Deck-O-Seal.

1. For submerged joints:

a. Latasil, one component, neutral cure, high performance, 100% silicone sealant in the color(s) as selected. Shall be used in conjunction with Latasil 9118 Primer per manufacturer's recommendations.

b. Mapesil T, 100% silicone sealant in the color(s) as selected.

2. For joints behind the coping, or other horizontal deck joints:

a. Deck-O-Seal, two component (gun-grade or pourable, self-leveling), high resilience, non sag, non flowing, polysulfide-based sealing compound in the color(s) as selected. Shall be used in conjunction with P/G Primer per manufacture's recommendations.

B. Material Storage

1. All materials are to be stored in the original unopened factory containers in a cool dry location 60 to 80 degrees F. Protected from the elements and the hazards of construction. Open only as many containers as can be used in any particular period.

C. Joint Preparation

1. Clean the joints of all deleterious material, to sound, clean and dry substrate.

2. Joint is to be formed or filled with an approved, resilient, non-asphaltic, closed cell, polyethylene joint filler material down to firm substrate. Allow space at the top of the joint for the installation of approved closed cell polyethylene backer rod and install same to the required depth below the surface of the slab to control the depth of the sealant bead to within manufacturer requirements.

D. Surface Preparation

1. Concrete surfaces to receive sealant must be fully cured, clean, dry and free of dirt, dust and any deleterious material that might compromise the adhesion and performance of the sealant. Curing aids, form release agents and joint former residue must be completely removed, if necessary by sand blasting and/or grinding. Loose dust must be brushed off.

2. Prime all surfaces to receive Latasil sealant with Latasil 9118 Primer prior to sealant application, and surfaces to receive Deck-O-Seal sealant with P/G Primer prior to application.

E. Application

1. Apply sealant in accordance with the manufacturer's recommendations.

2. Tool the joint immediately after application to insure a firm, intimate contact with the joint interface.

3. Remove excess sealant and smears from adjacent surfaces with Xylol or Toluol before sealant cures.

4. After the sealant has fully cured (generally a minimum period of five days at 72 degrees and 50% humidity), paint the surface of the sealant with a chlorine resistant chlorinated rubber or equivalent pool paint, such as Ramuc, in a compatible color as selected by the Architect. NOTE: Latasil cannot be painted.

2.19 AQUATIC FACILITY MANAGEMENT APPLICATION

Contractor shall provide a one-year license for a web-based digital application for managing the aquatic facility. Digital application shall include fully customizable check lists, pool testing documentation with NSPF dosage calculations and MAHC references, MAHC compliant lifeguard in service documentation with the ability to link to employee tracking module, pool closure forms, and incident reports. Web-based digital application shall be Facility Manager, or approved equal, contact Johnathan Nies at 303-323-8527 or online at https://nl290.infusionsoft.app/app/storeFront/showStoreFront

A. Contractor shall have web-based digital application representative provide one-hour of online training.

B. Contractor shall set up web-based digital application in Owners name 30 days prior to facility opening.

2.20 UNDERWATER LIGHTS

A. Underwater lights shall be equivalent to 500 watts of incandescent light. Underwater lights shall be UL listed and in the quantities shown and as detailed in the construction drawings and as described in these specifications. Coordinate for proper installation. Refer to the drawings for quantities and locations.

B. The pool underwater lights shall be 120VAC, 55 watts LED-type, and equivalent to 500 watts of incandescent light. Fixture housing shall be stainless steel construction with minimum wall thickness of 0.020 inch per UL 676 underwater pool lighting standard. The niche shall be stainless steel with cast brass mounting ring or PVC plastic with stainless steel mounting ring. Brass construction pressure grounding lug on interior and exterior services. Lens shall be 8-3/8 diameter clear tempered heat resistant glass. Gasket to be single-piece "U" shaped santoprene or silicone. Fasteners shall be silicon-bronze or stainless steel. The light fixture shall be supplied with a #16-3 STW (120V) submersible cord with ground wire positively grounded inside the fixture. Cord entrance shall be a watertight seal and epoxy encapsulated. Light fixture to be IntelliBrite 5g White LED pool light series by Pentair Commercial Pool and Aquatics or approved equal. Underwater lights shall be provided with cord length as required to allow for deck relamping of all fixtures.

C. Junction boxes shall be provided in the quantities required and shall be located at least 8” above the pool coping and 5' from the pool edge. Refer to the Electrical drawings. Cord length shall be sufficient to run from fixture to the junction box with sufficient cable in the niche to re-lamp the fixture on the deck. Junction boxes shall be furnished by the Contractor and installed by Electrical.

2.21 WATER FEATURES AND SUPPORT EQUIPMENT

A. The CONTRACTOR shall provide and install a trampoline and spotting rig.

1. The trampoline shall be a folding trampoline with bed area of 7 feet by 14 feet with overall frame footprint of 10 feet by 15 feet. The equipment is intended to be used indoors in a humid, natatorium space. The frame shall be heavy duty steel tubing and be foldable for ease of storage. Include thick pads covers for edge frame. Trampoline should come with 10 inch springs and a wheel trolley set – for rolling the trampoline away when folded. Base of design; Ross 7 x 14 Folding Trampoline from Springboards and More.

2. The trampoline spotting rig shall be for a folding trampoline. The spotting rig is constructed of 11 gauge square tubular steel and is painted BLACK unless otherwise specified. Other color options are Royal Blue or Primer-coat only with brown / rust primer that would allow the Owner to paint the unit to match school / facility colors.

a. The CONTRACTOR shall provide a Spotting Rig Accessory Kit. The kit comes complete with one 55 foot section and one 40 foot section of ½ inch or 7/16 inch Nylon-Poly static rope. One high load Double or one high load Single aluminum alloy pulleys, three Mailon-Rapide 10mm galvanized steel quick links (for attaching the spotting pulleys to the spotting rig), two swivel clips (for attaching the spotting rope to the spotting belt). Spotting Rig features shall have the EXCLUSIVE Triple Failure Protection. Pulleys, rope and quick links are the same items used by Fire and Rescue workers around the world, and all have high minimum tensile strengths and high working limits.

b. Provide Spotting Belt and Twisting Belt.

c. Base of design; Trampoline Spotting Rig for a Folding Trampoline, by Springboards and More.

2.22 MOVABLE BULKHEAD

A. MATERIAL

1. The CONTRACTOR shall provide and install two movable bulkheads. Bulkheads are to be fabricated to match the design of the end wall gutter. The bulkheads must span the width of the pool. The top of the bulkhead shall be designed as a walkway and shall be flush with the end walls of the pool as shown and extended over the rollout gutter on the side walls.

a. (1 required) The dimensions are nominally 4 feet 0 inches wide by 75 feet 3/4 inches long by 5 feet 0 inches deep.

b. (1 required) The dimensions are nominally 6 feet 0 inches wide by 75 feet 3/4 inches long by 5 feet 0 inches deep.

2. Provide a complete fiberglass movable bulkhead that is entirely constructed of materials which are unaffected by corrosion when immersed in chlorinated swimming pool water. Paint or protective coatings on any internal or external areas of the bridge are prohibited.

3. The movable bulkhead in its original solid state must be permanently compatible with chlorinated swimming pool water. The use of carbon steel, mild steel, aluminum, manganese, copper, brass or wood for any structural section, fasteners, hardware or parts of the bridge will not be allowed.

4. Bulkhead manufacturer shall supply anchor pin assemblies and support structure integral to the bulkhead, and be responsible for coordinating proper alignment, operation, and support of the bulkheads on the gutter curb, as well as its locking mechanisms that will rigidly set the bulkhead at each course as shown on the drawings.

B. The bulkhead shall be designed to support 5600 lbs with ½" maximum deflection. The safety factor for all live and dead loads shall be at least 10. The bulkhead shall be designed for a uniform lateral live load of at least 30 pounds per linear foot and a point load of at least 500 pounds at the center with a maximum deflection of ½ inch. Racing lane cup anchors shall be molded into the structure and be designed to prevent pullout at a load of at least 400 pounds each.

C. Bulkhead shall feature a toe ledge as shown on the drawings. The toe ledge shall allow water to flow through the bulkhead to ease the moving of the bulkhead.

D. Bulkhead shall feature additional floating lane line anchors as shown on the drawings to provide the pool with floating water polo boundary anchor locations.

E. Bulkhead shall be fitted with anchors for racing starting platforms in the locations noted and in the positions required by the manufacturer of the selected starting platforms. The anchor installations shall be reinforced to produce negligible deflection under the maximum loading conditions recommended by the starting platform manufacturer.

F. Removable guard rails shall be provided at both ends of the bulkhead. Rails shall be custom fabricated of one continuous length of tubing. The tubing shall be type 316L stainless steel, 1.900 inch OD x .145 inch wall thickness polished to 320 grit.

G. The internal air chambers shall be so constructed that when adding air pressure to raise the bulkhead for a change in position it shall be balanced and eliminate the need for removal of the starting platforms. Moving the bulkhead shall be easily accomplished by one person at each end of the bulkhead. Units shall glide freely on corrosion proof guides, or skid plates, both at the gutter lips and side walls. Provide all equipment, including blowers, necessary to operate air flotation chambers.

H. Suitable means of anchoring the bulkhead shall be provided to resist all dead and live load components. Contractor shall provide and install the anchor plates at the park positions shown on drawings. Install a 1" thick fiberglass pin plate receptacle at each park position similar to Stark Model Number SB051. Bulkhead shall be anchored to the end wall for long course competition.

I. Suitable provisions for electronic timing system shall also be provided. Access hatches shall be included at both ends of the bulkheads to facilitate inspection of the interior of the bulkheads, anchor mechanisms, and to allow for installation of future wiring in an existing raceway gutter to carry electronic timing cables and conductors.

J. Provide factory trained and experienced personnel for coordination, consultation, and instruction for the actual bulkhead delivery and for training of the Owner's personnel in the use, operation, and maintenance of the bulkhead. Provide necessary instruction and coordination as required to coordinate anchorage installation.

K. Provide racing lane line anchors at water line along only those faces of the bulkheads where shown on the drawings.

L. Lane line and men and women's water polo boundary line anchors shall be included with the pool bulkhead. The cup anchors shall be molded into the structure and supplied with a stainless steel pin for attachment.

M. Racing lane targets shall be supplied on those sides of the movable bulkhead where shown on the drawings. Lane targets to coincide with lanes on the pool floor and markers on the pool walls.

N. The entire surface of the bulkhead shall be slip resistant. This shall include the black wall targets and white field surface.

O. Quality Assurance

1. A factory quality control program must be submitted to the Owner/Architect with submittals, which ensures that structural tolerances critical for Movable Bulkheads used for competition have been maintained.

P. Basis of design: The bulkhead shall be manufactured by Stark Bulkheads, Inc. (360-403-7707), or approved equal.

Q. Guarantee

1. The manufacturer and Contractor shall guarantee that on completion of the installation, the unit will move freely from one location to the other, providing walls are straight and parallel and do not vary more than plus or minus 1/2 inch and will not rack or bind/stop when moved. Bulkhead manufacturer and Contractor shall coordinate the unrestricted travel of the bulkhead the entire length of the pool (unless noted differently on the drawings).

R. Installation of Bulkhead

1. The installation shall be true, level and plumb with the existing structure to permit full range of movement.

2. The exposed surfaces will be free of all imperfections or irregularities. A field inspection by the Owner/Architect will be conducted upon completion of the installation to ensure compliance before acceptance.

3. During installation, protection shall be provided for the existing deck, pool walls, pool floor and general building construction. The Contractor shall bear the costs for replacement or repair as a result of damage by neglect.

4. Support jacks shall be used beneath the bulkhead until the pool is filled and the bulkhead becomes self-supporting.

5. All costs for installation onto the pool gutter, adjustments, certification of dimensions and cleanup upon completion shall be borne by the Contractor.

6. Contractor shall locate the anchor plates at each stop point and at end walls. Race course dimensions shall be field certified in compliance with the competitive standards having jurisdiction and be submitted to Owner/Architect in writing by the certifying engineer or land surveyor.

7. The bulkhead shall not be moved until water is in the pool and at the level of the gutter lip.

8. Provide instruction to the Owner's personnel in use, operation, and maintenance of the bulkhead.

2.23 POOL COMPRESSED AIR BUBBLING SYSTEM - SPARGER

A. Cast into the pool shell 4 depressions to house an air sparger under the following: 3-meter springboard, 5-meter platform, 7 ½-meter platform, and 10-meter platform. Locate and dimension as indicated on drawings. Provide the sparger units into the depressions. Make all pipe connections from each sparger unit and run each pipe into the storage room and connect to the compressor unit.

B. CONTRACTOR shall provide the control box for operation of the air bubbler system in a wall near the diving pool and shall provide the wiring from the control box to the compressor unit. CONTRACTOR shall provide the control wiring.

C. Provide one (1) 60-CFM rotary screw compressor rated 75 CFM at 200 PSIG actual with one (1) 30 HP motor (1800-RPM) O.D.P. 480V, 3 phase, 60 cycle. Compressor shall be completely factory pre-wired and shall include a standard full voltage magnetic starter. The compressor package includes coalescing and charcoal filters with auto drain, integral air dryer, a regulator and remote motor starter. Compressor as manufactured by Kaeser, Ingersol Rand, Atlas Copco, or approved equal will be considered.

D. Provide one (1) vertical air receiver suitable for 200 PSIG working pressure with total volume of 660 gallons with auto drain.

E. Provide Diffusers and Piping System - There are four diffusers required. The strip will be embedded in the pool bottom and supplied by 3" ABS, stainless steel, HDPE OR Schedule 80 CPVC piping. Each diffuser location shall be equipped with an accessible enclosure that houses a stainless steel swing check valve. All Underground piping shall be approved for use with compressed air up to 200 PSI and tested on site to 75PSI.

F. Provide Control System - There are several components to the control system, the transmitter, receiver, power supply, injection valve and interlocks. The control system will require a 115 VAC supply and a hard-wire connection between the control station and the compressor. The Architect shall approve the location of the receiver. The wiring shall be done per Division 26 and coordinated with the pool wiring.

G. Provide Remote Control Transmitter - The one-channel control transmitter is similar to a television or other remote control device. The transmitter case is made of high impact plastic with a fully sealed membrane type switches to provide a dirt and moisture free environment. The unit is small and light enough to be placed in shirt pocket or hung around the neck on a lanyard. The switches are alternate action; pushing once turns the system on. Transmitter shall be capable of controlling each sparger diffuser line with a separate button.

H. Provide the following components: one (1) ball valve for tank shut-off, automatic water trap (115V), tank safety valves set at 220 PSIG, pressure gauges, pressure reducing valve, pressure switch 200/175 PSI, punch opening electric activated air-operated mechanism (corrosion resistant solenoid valves), remote control device on coil cord, and one quick disconnect fitting for an air hose in the filter room, easily accessible to the pool operator.

I. All above ground exposed piping shall be copper or stainless steel.

J. A supplier's representative for the equipment specified shall be present at the job site for installation, assistance, inspection and certification of the installation, equipment testing, startup assistance, and training of the Owner's personnel. Prior to startup, all equipment described herein shall be inspected for proper alignment, proper connection, and performance by means of a functional test.

K. Sparger system shall be manufactured by Pulsair Softwater Landing, Aquair bubbling system, Aquatic Development Group Inc., Natare Corporation, or approved equal.

2.24 POOL HEATERS

A. The pool heaters for the competition pool/dive pool/endless pool (Alternate #2) shall having the following input ratings:

1. Competition Pool input rating of 2,000,000 Btu/hr. – (2) model APN1000

2. Dive Pool input rating of 1,800,000 Btu/hr. – (1) Model APN1750

3. *Endless Pool supplied in packaged system (Alternate #2) – 5.5kw Coates Electric Heater – 240V, 1 Phase, 23 Amps

B. Basis of design: the pool heater for the competition pool/dive pool shall be manufactured by LOCHINVAR, model AQUAS Commercial Model APN.

C. The pool heater shall be orificed for operation on (Natural Gas).

D. The package system shall be made of a BOILER plant with a Shell and Tube POOL HEAT EXCHANGER. The design of the system shall be such that pool water, shall be heated indirectly by the Shell and Tube Heat exchanger and is never directly heated by the boiler plant. The BOILER and the POOL HEAT EXCHANGER shall be completely factory piped and assembled and shall include a cast iron circulating pump, expansion tank, flow switch, ASME Certified pressure relief valve set for 50psi, automatic fill valve with pressure reducer and a temperature / pressure gauge. The entire package shall be skid mounted, pre-piped, assembled, and pressure tested and ready for installation.

E. The BOILER components shall be as follows:

1. The BOILER shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. There shall be no banding material, bolts, gaskets or "O" rings in the header configuration. The 316L stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

2. The BOILER shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The BOILER shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard and the minimum efficiency requirements of the latest edition of the BTS2000 Standard. All models shall operate up to 97% thermal efficiency with pool water temperatures below 100°F. The BOILER shall be certified for indoor installation.

3. The BOILER shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The BOILER shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The BOILER with 399,000 through 800,000 Btu/hr input shall be capable of full modulation firing down to 20% of rated input with a turndown ratio of 5:1. The BOILER with 1,000,0000 through 1,500,000 Btu/hr input shall be capable of full modulation firing down to 10% of rated input with a turndown ratio of 10:1. The BOILER shall operate in a safe condition at a de-rated output with gas supply pressures as low as 4 inches of water column.

4. The BOILER shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The BOILER shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 30 psi; outlet water temperature sensor; return water temperature sensor; outdoor air sensor, flue temperature sensor; flow switch.

5. The BOILER with 399,000 thru 800,000 Btu/hr input shall feature the “SMART SYSTEM” control with an LCD display and navigation dial. The BOILER with 1,000,000 thru 1,500,000 Btu/hr input shall feature the “SMART TOUCH” control with an LCD touch screen display. The BOILER shall have password security, pump delay with freeze protection, pump exercise, domestic hot water prioritization and PC port connection. The BOILER shall allow 0-10 VDC input connection for BMS control and

have built-in “Cascade” to sequence and rotate while maintaining modulation of up to eight packages without utilization of an external controller. Supply voltage shall be 120 volt/60 hertz/ single phase.

6. The BOILER shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 28 data points for safety and operating controls, i.e., Auxiliary Relay, Auxiliary Proving Switch, Manual Reset Low Water Cutoff, Flow Switch, High and Low Gas Pressure switches, Tank Thermostat, Wall Thermostat/Zone Control, System Supply Sensor, Outdoor Sensor, Building Management System signal and Cascade control circuit. A high voltage terminal strip shall be provided for Supply voltage. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump. The dry pump contacts shall be sized for up to 1.5 hp/120V, 3 hp/240V or 30 amp pumps.

7. The BOILER shall be installed and vented with one of the venting installations described below (confirm venting installation/configuration with Building Mechanical Engineer):

   a. Direct Vent Sidewall system with a horizontal sidewall termination of both the vent and combustion air. The flue shall be PVC, CPVC or Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the BOILER from the outside. The air inlet pipe may be PVC, CPVC, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on the same sidewall with the manufacturer’s specified air inlet cap. The BOILER’s total combined air intake length shall not exceed 100 equivalent feet. The BOILER’s total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

   b. Direct Vent Vertical system with a vertical roof top termination of both the vent and combustion air. The flue shall be PVC, CPVC or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the BOILER from the outside. The air inlet pipe may be PVC, CPVC, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on the roof top with the manufacturer’s specified air inlet cap. The BOILER’s total combined air intake length shall not exceed 100 equivalent feet. The BOILER’s total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

   c. Sidewall Vent with Room Air system with a horizontal sidewall termination of the vent with the combustion air drawn from the interior if the building. The flue shall be PVC, CPVC or Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. The BOILER’s total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

   d. Vertical Vent with Room Air system with a vertical rooftop termination of the vent with the combustion air drawn from the interior of the building. The flue shall be PVC, CPVC or Stainless Steel sealed vent material terminating at the rooftop with the manufacturers specified vent termination. The BOILER’s total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

   e. Vertical Vent with Sidewall Air system with a vertical rooftop termination of the vent with the combustion air being drawn horizontally from a sidewall. The flue shall be PVC, CPVC, or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the POOL HEATER from the outside. The air inlet may be PVC, CPVC, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on a sidewall using the manufacturers specified air inlet cap. The BOILER’s total combined air intake length shall not exceed 100 equivalent feet. The BOILER’s total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

   f. The BOILER shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 20 ppm or less corrected to 3% O2. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

g. The BOILER shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments.

h. The BOILER shall be suitable for use with polypropelene glycol, up to 50% concentration without contingencies.

8. The SHELL AND TUBE POOL HEAT EXCHANGER shall have a working pressure of 87 psi and shall be constructed of Cupro-Nickel Tubes and Bronze Headers and carry a one (1) year limited warranty. The POOL HEAT EXCHANGER shall be sized so that heat can be transferred into the pool water with an efficiency of up to 99%. The entire assembly shall be mounted on "I" beam skids to facilitate handling and installation.

9. The CIRCULATING PUMP shall be constructed of cast iron and operate on a 120 volt, 60 Hz, 1 phase power supply (unless otherwise specified). The pump shall be factory wired to run with intermittent pump operation

10. The EXPANSION TANK shall be of a bladder type design and shall be sized adequately to allow for the expansion of the boiler water when heated.

11. The FLOW SWITCH shall be of a paddle type design and shall be wired to the internal boiler control safety circuitry so to not allow the boiler to operate when there is not sufficient flow.

12. The AUTOMATIC FILL VALVE WITH PRESSURE REDUCER shall be factory set for 15 psi and shall allow fresh water to be added to the boiler system only when the water pressure has fallen below the pressure setting.

13. The PRESSURE RELIEF VALVE shall be ASME Certified and have a setting of 50 psi.

14. The TEMPERATURE AND PRESSURE GAUGE shall be capable of reading temperature in both degrees Fahrenheit and degrees Celsius. The Pressure units shall be read in pounds per square inch (psi)

15. The Contractor shall provide the pool water heating system. Heating system to include all piping, heaters, booster pumps, controls, gauges, thermostats, control valves and wiring required to draw water from the recirculation piping, heat the water and return it back to the recirculation piping. The Contractor shall interlock pool heating system with pool recirculation pumps.

16. Contractor shall have pool heater manufacturer representative on site to start and adjust pool heater. Copies of the startup report shall be sent to the Manufacturer and Architect/Engineer prior to final site observation and shall include the following information for each pool heater:
    a. Temperature settings
    b. Inlet Gas Supply Pressure
    c. Manifold Gas Pressure
    d. Air Pressure
    e. Gas Piping Configuration
    f. Venting Configuration
    g. Booster pump interlocked with recirculation pump
    h. Flow switch installed
    i. A component and integrated check shall be made of all controls. Factory tests do not substitute for this test.

2.25 DIVE PLATFORM SURFACING

A. Slip-Resistant Springboard Platform Padded Surfacing

1. This work shall include furnishing and installing a Mondo DIVETEX padded surface for springboard platforms.

2. Material:

a. Rubber surfacing shall be prefabricated, calendered and vulcanized with a particular closed cell structure, based on special isoprenic rubbers, mineral filters, stabilizing agents and pigmentation, highly resistant to UV rays and atmospheric agents, with system of differential elasticity between top surface and base.

b. Surface shall have a thickness of ½" (12mm).

3. Adhesive:

a. The adhesive shall be a high performance two-part polyurethane adhesive for both indoor and outdoor installations of the Mondo DIVETEX surfacing. It shall have an excellent resistance to moisture, heat, and water.

b. The adhesive shall be PU 105 Polyurethane Adhesive.

4. Installation:

a. Installation of the DIVETEX surfacing shall be performed by a flooring contractor experienced in projects of this size and scope.

b. The concrete surface shall be clean, and without paint or other contaminants.

c. Scarify the concrete surface prior to installation.

d. If curing compounds were used, the surface must be thoroughly cleaned prior to installation.

e. After installation, add weight around the edges and seams of the surfacing material until the adhesive is completely dry.

f. Seal the edges of the surfacing with a bead of clear silicone caulk.

5. Delivery, Storage, and Handling:

a. Materials must be delivered in the manufacturer's original unopened and undamaged containers with identification labels intact.

b. Store material upright on a clean, dry, flat surface protected from all possible damage, and protect from exposure to harmful weather conditions.

c. Recommended environmental condition for storage is a minimum of 55° F.

6. Site Conditions and Installation:

a. Maintain a stable room and concrete temperature for a period of 48 hours prior, during, and 48 hours after installation. Recommended range is between 65° F and 86° F.

b. Installation to be carried out no sooner than the specified curing time of the concrete.

c. Moisture vapor emission content of the concrete slab must not exceed 5 lbs. / 1,000 SF / 24 hours when tested using the anhydrous calcium chloride test as per ASTM F1869.

d. Installation of the DIVETEX flooring shall not commence until all other trades in the building are completed.

e. Follow manufacturer's installation instructions for both DIVETEX flooring and PU 105 adhesive.

7. DIVETEX padded surface and PU 105 adhesive shall be manufactured by Mondo USA and supplied by Springboards and More (Phone #: 877-348-3246).

B. Slip –Resistant Dive Platform Surfacing

1. This work shall include furnishing and installing a Rough-Tex slip-resistant padded surface for dive tower platforms.

2. Three-Ply Black Rough-Tex

   a. Material shall be 5/16” thick, high strength synthetic fabric with a nylon backing, and a 225 lb tension rating.

3. The front edges (horizontal and vertical) of this material shall be cut by the factory, and be a clean, straight edge.

4. Adhesive:

   a. The adhesive shall be a high performance two-part polyurethane adhesive for both indoor and outdoor installations of the Rough-Tex surfacing. It shall have an excellent resistance to moisture, heat, and water.

   b. The adhesive shall be PU 105 Polyurethane Adhesive as manufactured by Mapei.

5. Installation:

   a. Installation of the Rough-Tex surfacing shall be performed by a flooring contractor experienced in projects of this size and scope.

   b. The vertical surfacing of the front edge of the platform shall be installed before the horizontal surfacing. The length of the horizontal surfacing shall include the length of the concrete platform plus the thickness of the vertical surface; the horizontal surface shall overlap the vertical surface. A clean, straight, square, factory cute edge shall be installed at the leading edge of each diving platform with the horizontal material lapping the thickness of the material installed on the vertical face.

   c. The concrete surface shall be clean, and without paint or other contaminants.

   d. Scarify the concrete surface prior to installation.

   e. If curing compounds were used, the surface must be thoroughly cleaned prior to installation.

   f. After installation, add weight around the edges and seams of the surfacing material until the adhesive is completely dry.

   g. Seal the edges of the surfacing with a bead of clear silicone caulk.

6. Delivery, Storage, and Handling

   a. Materials must be delivered in the manufacturer’s original unopened and undamaged containers with identification labels intact.

   b. Store material upright on a clean, dry, flat surface protected from all possible damage, and protect from exposure to harmful weather conditions.

   c. Recommended environmental condition for storage is a minimum of 55° F.

7. Site Conditions:

a. Maintain a stable room and concrete temperature for a period of 48 hours prior, during, and 48 hours after installation. Recommended range is between 65° F and 86° F.

b. Installation to be carried out no sooner than the specified curing time of the concrete.

c. Moisture vapor emission content of the concrete slab must not exceed 5 lbs. / 1,000 SF / 24 hours when tested using the anhydrous calcium chloride test as per ASTM F1869.

d. Installation of the Rough-Tex surfacing shall not commence until all other trades in the building are completed.

e. Follow manufacturer's installation instructions for both Rough-Tex surfacing and PU 105 adhesive.

8. Rough-Tex slip-resistant surfacing shall be supplied by Springboards and More (Phone #: 877-348-3246).

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS, INSPECTION AND PREPARATION

A. Carefully examine all of the contract documents for requirements that affect the work of this section. Prior to starting any work, notify the General Contractor of defects requiring correction. Do not start work until conditions are satisfactory.

B. Verify that all work by others, related to this section, has been completed. This includes all earthwork, concrete work, and mechanical, electrical and plumbing connections.

C. Protect all materials and work completed by others from damage while completing the work in this section.

3.2 FIELD MEASUREMENTS

A. Verify benchmark and pool location prior to layout.

B. If field measurements differ from the construction drawing dimensions, notification shall be given to the Architect prior to proceeding with work.

3.3 EXCAVATION, REINFORCING STEEL AND SWIMMING POOL CAST-IN-PLACE CONCRETE

A. Reference Division 31 - Earthwork

B. Reference Division 3 - Concrete

C. Reference Section 131101 – Swimming Pool Cast-In-Place Concrete

3.4 TOLERANCES FOR CONSTRUCTION OF THE POOL SHELL

A. The completed structures shall be constructed level and to the dimensions, elevation, depths and thickness as shown on the plans.

B. The elevation tolerance of the pool shell and gutter lip shall be plus or minus 1/8 inch.

C. The vertical wall surface tolerance of the pool shell, for the first 36 inches from the water surface shall be plus or minus 1/4 inch from plumb measured with a 6 foot straight edge.

D. For competitive race courses, the following pool shell tolerances shall apply:

Course	Tolerance	Minimum	Maximum
25 Yard	+ 1 3/16" /- 0"	75' – 3/4"	75' – 1 15/16"
25 Meter	+ 0.010 M	25.02 M	25.03 M
50 Meter	+ 0.010 M	50.02 M	50.03 M

1. The above dimensions include allowances for a touchpad at each end of the course. The maximum dimension includes the construction tolerance. These above tolerances also apply to courses utilizing moveable bulkhead(s).

2. The above dimensions apply to a vertical plane extending 1'-0" above and 3'-0" below the surface of the water at all points of both end walls.

E. The CONTRACTOR shall provide the services of a registered engineer or land surveyor who shall measure and certify the elevations of the gutter lip at 10 foot centers as well as the length of each lane for each possible racing course. Courses designed with touchpads for competition shall be measured and certified with touchpads in place. Course length survey must be made with the pool filled with water between 78 and 82 degrees Fahrenheit. Forms for the lane measurements are available from USA Swimming (719-866-4578) and must be submitted by the Contractor.

F. Ground wires or grade pins, if used, shall be installed in such a manner that they accurately outline the section of the pool shell as indicated on the plans. They shall be located at intervals sufficient to insure proper thickness throughout and shall be maintained tight. Grade pins or grounding wires shall not be permanently embedded in the pool shell.

3.5 WATER TIGHTNESS TEST

A. This test applies to the pool(s), the surge tank(s), and the gutter system(s). The water tightness test shall be completed prior to the application of the pool finish.

B. Water Tightness Test Procedure

1. Preparation

a. Allow the concrete structure to set 28 days for curing purposes. Once the pool shell has gained sufficient strength to withstand the test load and after all the outlets have been securely sealed, the pool shall be filled with water.

2. Fill: Fill and then isolate the pool(s), the surge tank(s), and the gutter system(s). The water tightness test shall begin after the vessel has been filled for a minimum of three (3) days. During the filling, all outlets shall be monitored for water tightness and all concrete joints shall be monitored for any visible leakage. If any visible leakage from the vessel is observed, the condition shall be corrected prior to the start of the test.

a. After the initial fill, all ground water shall be removed from the pool sight sump or the pool location de-watering system. This shall be completed prior to the start of the water tightness test. De-watering of the pool sight sump shall be maintained during the entire duration of the test.

3. Evaporation Measurement Procedure

a. Fill a floating, restrained, partially filled, calibrated, open container with water and allow the container to float within the pool during the testing period. This will be used to measure evaporation.

4. Measurement

a. On a separate sheet of paper draw a sketch of the pool. Measurements shall be taken at the pool(s), the surge tank(s), and the gutter system(s). Multiple test points with averaging are recommended for vessels which will be exposed to wind. Document the separate findings on the chart below. Repeat the measurements and document every 12 hours for a total of three (3) days. The General Contractor shall check the pool(s), the surge tank(s), and the gutter system(s) for water loss with the

Architect or Owner's representative every 12 hours. The Contractor(s) shall submit photo documentation of each measurement with the completed water tightness report.

Total Allowable Water Loss:	Total Gallons:	_____	(0.1%) x 0.001 = _____	Allowable Loss	Pan Depth Per 24 Hrs.
Pool Measurements	Competition Pool	Dive Pool	Gutter System	Surge Tank _	Pan Measurements
12 Hrs.					
24 Hrs.					
36 Hrs.					
48 Hrs.					
60 Hrs.					
72 Hrs.					

5. Total Loss = 7.481 x Structure Surface Area (SF) x Total Water Loss per Day (FT) – Evaporation per Day (FT) + Precipitation per Day (FT)

   a. Day #1 =

   b. Day #2 =

   c. Day #3 =

6. Repair

   a. The allowable leakage rate for an unlined pool structure shall not exceed 0.1 percent of the total water volume in a 24-hour period. (Example: 0.001 x 200,000 gallon pool = 200 gallons per 24 hour period.) This excludes the loss/addition of evaporation/precipitation.

7. Absorption

   a. Waiting 3 days after the initial water fill will allow the concrete to absorb water and shall be sufficient to minimize the effect of absorption on the test results.

8. Evaporation

   a. Evaporation shall not have a significant effect on natatoria that are completely enclosed with no air circulation during the water tightness test. However, evaporation will have a significant effect on the water level in natatoria that has air movement across the water surface or are still partially uncovered.

9. If leaks are detected, repair the vessel and make water tight in accordance with these requirements.

10. With regard to this test, the curing requirements, the final fill and the cost of the water for two (2) complete fillings shall be borne by the Owner. Any subsequent fillings or partial fillings (more than 25%) of the pool shall be by the CONTRACTOR, at its own expense.

3.6 PIPING INSTALLATION

A. General

1. Provide and erect, according to the best practices of the trade, all piping shown on the drawings and required for the complete installation of these systems. The piping shown on the drawings shall be considered as diagrammatic in indicating the general run and connections, and may or may not in all

parts be shown in its true position. The piping may have to be off set, lowered or raised as required or as directed at the site. This does not relieve the CONTRACTOR from responsibility for the proper erection of the systems or piping in every respect suitable for the work intended as described in the specifications and approved by the Architect. In the erection of all piping, it shall be properly supported and proper provisions shall be made for expansion, contraction and anchoring of piping. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate installation will not be permitted. All pipes shall have burrs and/or cutting slag removed by reaming or other cleaning methods in strict accordance with the manufacturer's instructions. All changes in direction shall be made with fittings. All open ends of pipes and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the systems. Plugs of rags, wool, cotton waste or similar materials will not be used in plugging. All piping shall be arranged so as not to interfere with removal and maintenance of equipment, filters or devices, and so as not to block access to manholes, access openings, etc. Flanges or unions as applicable for the type of piping specified shall be provided in the piping at connections to all items of equipment. All piping shall be installed to ensure noiseless circulation. All valves and specialties shall be so placed to permit easy operation and access.

B. Pipe Hangers and Supports

1. Pipes shall be adequately supported by pipe hangers and supports specified in Paragraph 2.05 Pipe, Hangers, and Valves.

2. Horizontal PVC Schedule 80 piping shall be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 120 degree F and as listed below:

Nominal Pipe Size (Inch)	Hanger Support Spacing (Feet)	Minimum Rod Size for Single Rod Hanger (Inch)
1-1/4" and less	5	3/8"
1-1/2" to 3"	6	1/2"
4" to 6"	8	5/8"
8" to 12"	10	7/8"
Greater than 12"	12	1"

3. Horizontal CPVC Schedule 80 piping shall be supported in accordance with the manufacturer's recommendations for fluid temperature not exceeding 140 degree F and as listed below:

Nominal Pipe Size (Inch)	Hanger Support Spacing (Feet)	Minimum Rod Size for Single Rod Hanger (Inch)
½" and less *	4	3/8"
¾" to 2"	6	3/8"
2-1/2" to 3"	7	1/2"
4" to 8"	8	7/8"
Greater than 12"	10	1"

C. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape.

D. Install hangers to provide a minimum of 1 inch space between finished covering and adjacent work.

E. Place a hanger within 12 inches of each horizontal elbow.

F. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

G. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.05.C.3. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to the support spacing schedules.

H. Do not support piping from other pipes, ductwork or other equipment that is not building structure. Do not modify building structure for hanger installation.

I. Concrete Inserts

1. Provide inserts for placement in form work before concrete is poured.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Where concrete slabs form finished ceilings, provide inserts to be flush with the slab surface.

4. Provide hook rods to concrete reinforcement section for inserts carrying pipe over 4 inches.

J. Pipe Hangers and Supports

1. All piping shall be rigidly supported from the building structure by means of hanger assemblies properly selected and sized for the application in accordance with the manufacturer's recommendations and specifications.

2. All piping in a service tunnel, if required shall be supported by a structure of the CONTRACTOR'S design. The structure shall be non-corrodible and shall be of a size and configuration to rigidly support all the piping as shown in the plans at a minimum spacing as shown below.

3. Piping hangers shall be spaced per the below schedule and shall have hangers not more than one foot on each side of every change in direction. The piping systems shall be installed in an approved manner and shall not overload the building structural frame. The CONTRACTOR shall provide additional hangers and miscellaneous steel supports as required to distribute the piping system load over several structural members where required or directed. Maximum allowable spacing for piping shall be as follows:

PVC Piping	Maximum Spacing
3/4" thru 2"	5'-0"
2 1/2" thru 4"	6'-0"
6" thru 10"	9'-0"
12" thru 14"	12'-0"

4. Round rods supporting the pipe hangers shall be of the following dimensions:

1/2" to 2" pipe	-3/8" rod
2-1/2" to 3" pipe	-1/2" rod
4" to 5" pipe	-5/8" rod
6" pipe	-3/4" rod

5. Hanger rods shall be galvanized steel. Provide for controlling level and slope by turn buckles or other approved means of adjustment and incorporate lock nuts.

6. Where piping is installed side by side, the CONTRACTOR will support the piping by utilizing trapeze type hanger assemblies. Horizontal trapeze member shall be non-metallic channel. The CONTRACTOR shall provide heavier members as required for the load to be supported for the entire span distance. Hanger rods shall be as specified above and properly sized for the load supported, but not less than 5/8 inches diameter.

7. The use of pipe hooks, chains, or perforated iron for pipe hanger supports will not be permitted.

8. Attachment of piping hangers to the building structure shall be provided in a manner approved by the Architect. The CONTRACTOR shall provide concrete inserts to be installed by the General Contractor in the building construction at the time the concrete is poured and hangers shall be attached to these inserts.

K. Piping Installation

1. Trench bottoms shall be smooth and free of rocks and debris. If the trench is dug in ledge rock, hardpan or where large boulders are not removed, place 3 inches of sand or compacted fine-grained soil below pipe. Pipe must be supported over its entire length with firm, stable material. Blocking will not be used to change pipe grade or provide intermittent support over low sections in the trench. Surround the pipe with backfill meeting the requirements of Section 312000 with a particle size of 1-1/2 inch or less and in accordance with the project geotechnical report. Compact in layers not to exceed 6 inches with vibratory method. Follow installation methods of ASTM D2774 "Underground Installation of Thermoplastic Pressure Piping".

2. Installations are to be installed in a straight run of pipe, with a minimum 10 pipe diameters upstream and minimum 5 pipe diameters downstream of any pipe fitting.

L. Flushing, Draining and Cleaning Pipe Systems

1. The CONTRACTOR shall flush out all water systems with water before placing them in operation. Other systems shall be cleaned by using compressed air or nitrogen. After systems are in operation and during the test period, all strainer screens shall be removed and thoroughly cleaned.

M. Expansion and Contraction

1. The CONTRACTOR shall make all necessary provisions for expansion and contraction of piping with offsets, loops, flexible connections and anchors as required to prevent undue strain. The CONTRACTOR shall provide shop drawings for proposed method and arrangement for control of expansion and contraction of piping.

N. Testing

1. All piping installation and pressure testing shall be reviewed by the Owner’s testing agency before commencement of backfilling. A minimum notice of one (1) week is required prior to review. Results of review shall be documented.

2. All pool related piping, shall be hydraulically pressure tested (with water, not air) to a pressure of not less than 50 PSI for a period of no less than two (2) hours.

3. Contractor is responsible for the maintenance of a sustained 20 PSI pressure on all pool related piping throughout the course of construction.

4. The Contractor shall adhere to the applicable provisions of Division 22 - Plumbing, "General Provisions" and "Basic Materials and Methods" for installation of piping system.

3.7 EQUIPMENT AND SYSTEMS INSTALLATION

A. The CONTRACTOR shall assemble and install all equipment, special parts and accessories as shown on pool drawings, specifications and shop drawings of the equipment suppliers.

B. The CONTRACTOR shall provide all anchors and inserts to be imbedded in the deck including all fittings, inserts and structure sleeves and required anchorage as shown on the plans and as indicated in this section of the specifications. Equipment shall be set true and plumb, using factory jigs where available. Removable equipment items shall be easily removable from anchors and shall fit without noticeable wobble.

C. Provide templates for all equipment anchors. Provide anchor bolts of the size and spacing as required by the equipment manufacturer. All anchor bolts shall be stainless steel Type 316L and of a length capable of adequate anchorage into rough slab-on-grade allowing for finish deck tile and setting bed. Anchors shall be set and cast into place during building concrete work. Inspect all anchor settings for horizontal and vertical alignment prior to placing concrete.

D. The CONTRACTOR shall install all equipment and systems in accordance with manufacturer's directions. Equipment shall all be assembled and in place for final observation.

E. All items necessary to complete this section are shown on the plans or described in the specifications including items that may be purchased by the Owner. Items are detailed and specified as a guide for dimensional purposes. The CONTRACTOR must make provisions accordingly and submit shop drawings and submittals based on that data.

3.8 START-UP AND INSTRUCTION

A. The CONTRACTOR shall supply the services of an experienced swimming pool operator/instructor for a period of not less than two days (total 16 hours) after the pool(s) have been filled and initially placed in operation. During this period, the Owner's representatives who will be operating the pool(s) shall be thoroughly instructed in all phases of the pool's operation. The CONTRACTOR shall deliver six (6) complete sets of operating and maintenance instructions for the swimming pool, structures, finishes and all component equipment. Prior to leaving the job, the CONTRACTOR shall obtain written certification from the designated Owner's representative acknowledging that the instruction period has been completed and all necessary operating information provided. The CONTRACTOR shall, in his contract, include the cost of two (2) additional days (total 16 hours) of instruction and operational check out by the qualified representative of the CONTRACTOR during the first season of operation.

B. Written reports of each of these visits outlining the pool's operation, competence and performance of the pool's operation personnel, and other pertinent comments shall be submitted to the Owner and Architect/Engineer within one (1) week after each visit.

C. The CONTRACTOR shall provide specific written procedures to be followed for emptying and refilling the pool as mentioned previously in this section. The procedures must be included in the bound volume of operating instructions and references in the front index with a note headed by the words: "CAUTION -- VERY IMPORTANT".

END OF SECTION

SECTION 13 11 01
SWIMMING POOL CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:

1. Swimming pools:
   a. Bottom slab.
   b. Walls.
   c. Miscellaneous features, slabs on grade and all other elements.

2. Surge tanks:
   a. Bottom slab, walls and top slab.

3. Dive towers and dive platforms:
   a. Platform slabs, beams, columns and walls.

B. Related Requirements:

1. Division 03 for all concrete not related to swimming pool construction.

2. Division 03 or Division 13 for water tightness testing.

3. Section 13 11 02 “Swimming Pool Shotcrete”. Shotcrete may be substituted for swimming pool cast-in-place walls.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for

ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.
e. Special Pool finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, anchor rod and anchorage device installation tolerances if required for equipment installation, under slab pipe encasement requirements, and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Engineer.

E. Samples: For waterstops.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Form materials and form-release agents.

4. Steel reinforcement and accessories.

5. Waterstops.

6. Curing compounds.

7. Bonding agents.

8. Joint-filler strips, if required.

9. Repair materials.

10. Dowel bar substitutes.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).

2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms (if indicated on drawings): Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

B. Dowel Bar Substitutes: Tapered, threaded couplers, pre-assembled to reinforcing with mounting plate for attachment to form work and a pressed in metal disc thread protector which can be easily removed. The mechanical connection shall meet building code requirements of developing in tension or compression. The mechanical connection shall be the positive locking, taper threaded type coupler manufactured from high quality steel. The bar ends must be taper threaded using the manufacturer’s requirements.

1. Lenton Form Saver; Erico Corp.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Sika Greenstreak.
   b. Vinylex Waterstop & Accessories.

2. Profile: Ribbed without center bulb, non-tapered.

3. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.75 mm thick); nontapered.

B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.

1. Products: Subject to compliance with requirements, provide the following:
   a. Synko-Flex SF302, Henry Company.
      1) Synko-Flex SF311 Solvent Based Primer.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. BASF Corporation-Construction Systems; Confilm.
   b. ChemMasters, Inc; Spray-Film.
   c. Dayton Superior; AquaFilm J74RTU.
   d. Euclid Chemical Company (The); an RPM company; Eucobar.
   e. L&M Construction Chemicals, Inc; E-CON.
   f. Metalcrete Industries; Waterhold.
   g. Sika Corporation; Caltexol CIMFILM.
   h. TK Products; TK-2120 TRI-FILM.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of pool finish.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
   a. BASF Corporation-Construction Systems; MasterKure CC 200 WB (Pre-2014: Kure-N-Seal W).
   b. Dayton Superior; Cure & Seal 1315 J22 WB.
   c. Euclid Chemical Company (The); an RPM company; Diamond Clear VOX.
   d. L&M Construction Chemicals, Inc; Dress & Seal WB.
   e. SpecChem, LLC; Cure & Seal WB 25.
   f. W.R. Meadows, Inc; Vocomp-20.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

1. Provide for cast-in-place concrete coping.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dayton Superior Corporation; Conspec Strong Bond.
   b. Euclid Chemical Company (The), an RPM company; Flex-Con.
   c. W. R. Meadows, Inc.; Sealtight Acry-Lok.
   d. Kaufman Products, Inc.; Surebond.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.
   a. Xypex Concentrate.

2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

3. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

5. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.
   a. Xypex Concentrate.

2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

3. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

5. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required,

for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR SWIMMING POOL ELEMENTS

A. Slabs, Walls, Coping and Other Elements: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

2. Maximum W/C Ratio: 0.42.

3. Minimum Cement Content: 600 lb/cu. yd.

4. Slump Limit: 4 inches (100 mm), 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.14 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

2. Class D, 1 inch (25 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

1. Comply with pool and gutter profile shown if edges not shown to be chamfered.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. If required for equipment or piping installation, install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support

reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Dowel bar substitutes may be used in lieu of lap splices.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams and slabs in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of slabs and beams.

5. Vertical joints in walls shall be located at corners, and in concealed locations where possible.

6. Use a bonding agent:
   a. At locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   b. At cove joint where cove mortar is placed against hardened wall and slab.
   c. At coping where coping is placed against hardened wall.

C. Contraction Joints in Slabs: No contraction joints shall be placed in pool bottom slab.

D. Joints in Coping:

1. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated, or, 2 feet maximum. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   a. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   b. Isolation Joints: Install vertical joint-filler strips at _ feet.
      1) Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants are indicated.

3.7 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous

diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Non-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING SLABS AND WALLS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Verify all finish requirements with swimming pool finish subcontractor before finishing concrete.

1. Provide certification, with swimming pool finish subcontractor, that concrete finish complies with manufacturer’s recommendations for final pool finish.

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform

in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with ceramic tile, paint, or another thin-film-finish coating system.

2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after

initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to

ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.

2. Headed bolts (if required for equipment and piping installation).

3. Verification of use of required design mixture.

4. Concrete placement, including conveying and depositing.

5. Curing procedures and maintenance of curing temperature.

6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when

concrete consistency appears to change.

3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

8. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF DOCUMENT

SECTION 13 11 02
SWIMMING POOL SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes shotcrete applied by dry-mix or wet-mix process for the following:

1. Swimming pool walls.

B. Related Sections include the following:

1. Division 13 Section “Swimming Pools” for pool shell tolerances and other items.
2. Division 13 Section “Swimming Pool Cast In Place Concrete” for pool bottom slabs and other pool-related structures.
3. Division 13 Section “Swimming Pool Cast In Place Concrete” for pool coping.
4. Division 03 or Division 13 for water tightness testing.

1.3 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the mixing water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

B. Design Mixtures: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. For predampened dry-mix mixtures, indicate amounts of mixing water to be added to the dry-mix materials before mixing and conveying through the delivery hose.

C. Shop Drawings: For shotcrete installation. Include support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support; and locations of proposed construction joints.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.
3. Form materials.

C. Preconstruction Test Reports: For shotcrete.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom attains mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests, is ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical Position, is ACI Shotcrete Nozzleman certified in Wet-Mix Process for Vertical Position as appropriate to the required shotcrete work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. ACI Publications: Comply with ACI 506.2, "Specification for Shotcrete," unless modified by requirements in the Contract Documents.

D. Shotcrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design shotcrete mixtures.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:

1. Produce shotcrete test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mixture, shooting orientation, and nozzle operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm).
2. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:

a. Strength Testing: Test each set of unreinforced specimens for compressive strength according to ASTM C 42/C 42M.
b. Core Grading: Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practical sizes to minimize number of joints.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice" and as follows:

1. For uncoated reinforcement, use all-plastic bar supports.

C. Reinforcing Anchors: ASTM A 36/A 36M, unheaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel; and carbon-steel nuts.

1. Finish: Plain, uncoated.

2.3 SHOTCRETE MATERIALS

A. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.

B. Portland Cement: ASTM C 150, Type I or Type III. Use only one brand and type of cement for Project.

1. Fly Ash: ASTM C 618, Class C or Class F.

C. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Combined Aggregate Size: ACI 506R or ASTM C 1436, Grading No. 2 sieve analysis.

D. Water: Potable, complying with ASTM C 94/C 94M, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.

F. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.4 ADMIXTURES

A. General: ASTM C 1141, Class A (liquid) or Class B (non-liquid), but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Accelerating Admixture, Conventional: ASTM C 494/C 494M, Type C or Type E.
2. Pozzolanic Admixture: Fly ash, ground granulated blast-furnace slag, and silica fume as limited in "Shotcrete Materials" Article.
3. Coloring Admixture: Coloring agent as limited in "Shotcrete Materials" Article.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based laboratory trial mixture or field test data, or both.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Cementitious Materials: Limit use of fly ash to not exceed, in combination, 15 percent of portland cement by weight.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

E. Admixtures: When included in shotcrete design mixtures, use admixtures according to manufacturer's written instructions.

F. Design-Mixture Adjustments: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.7 SHOTCRETE MIXTURES

A. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
2. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1-1/2 percent.

2.8 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.9 BATCHING AND MIXING

A. Dry-Mix Process: Measure mixture proportions by weight batching according to ASTM C 94/C 94M or by volume batching complying with ASTM C 685/C 685M requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. Comply with ASTM C 685/C 685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

2.10 RELATED MATERIALS

A. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following;

a. Latex Bonding Agent, Type II (Non-Redispersible):

1) Dayton Superior Corporation; Conspec Strong Bond.
2) Euclid Chemical Company (The), an RPM company; Flex-Con.
3) W. R. Meadows, Inc.; Sealtight Acry-Lok.
4) Kaufman Products, Inc.; Surebond

2.11 REPAIR MATERIALS

A. Concrete Patching Mortar: Chemical treatment for waterproofing concrete.

1. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.

a. Xypex Concentrate.

2.12 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

a. Bometals, Inc.
b. Greenstreak.
c. Meadows, W. R., Inc.
d. Murphy, Paul Plastics Co.
e. Progress Unlimited, Inc.
f. Tamms Industries, Inc.
g. Vinylex Corp.

2. Profile: Ribbed without center bulb.
3. Dimensions: 4 inches by 3/16 inch thick (150 mm by 10 mm thick); nontapered.

B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.

1. Products: Subject to compliance with requirements, provide the following:

a. Synko-Flex SF302, Henry Company.

1) Synko-Flex SF311 Solvent Based Primer.

2.13 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.

1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces to saturated, surface-dry condition before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. Dampen surfaces to saturated, surface-dry condition before shotcreting.

D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover.

E. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

3.4 WATERSTOPS

A. Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. Prevent displacement during shotcrete application.

3.5 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints unless otherwise indicated.

3.6 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.7 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.8 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment-control devices after shotcrete placement.

L. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.

M. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

N. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling.
2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

O. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

3.9 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R.

B. Natural Finishes:

1. Gun Finish: Natural undisturbed finish as sprayed.
2. Rod Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set. Do not push or float with flat part of trowel.
3. Broom Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set; followed by uniform brooming.

C. Flash-Coat Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finely textured finish.

D. Flash-Coat with Final Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve, and apply wood-float finish.

3.10 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C), provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C 173/C 173M, volumetric method or ASTM C 231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of thickness and reinforcing layout of shotcrete work on project. Testing agency will obtain sets of test specimens from each test panel.

1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.
2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. In-Place Shotcrete Testing: : Only if samples obtained in item D indicate unsatisfactory shotcrete, and only if directed by Owner, Architect or Engineer, take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed; whichever is less. Do not cut steel reinforcement.

F. Strength of shotcrete will be considered satisfactory according to the following:

1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.
2. Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.13 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.
2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.
3. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.14 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF DOCUMENT

SECTION 131103
SWIMMING POOL TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and General Provisions of the contract, including General and Supplementary Conditions apply to work of this section.

1.2 SUMMARY

A. The cementitious pool finish shall have ceramic tile markings and trim at locations including the pool perimeter tile band, vertical tile band, gutter and stair nosings, recessed wall steps, depth markings, wall targets, floor lane markings and all other tile installations as shown and detailed on the contract drawings and in strict accordance with these specifications.

B. The CONTRACTOR shall furnish and install the work of this section.

1.3 RELATED SECTIONS

A. Division 1 – Mock Ups

B. Division 7 - Joint Sealers

C. Division 9 - Ceramic Tile

D. Section 131100 - Swimming Pool

E. Section 131104 - Swimming Pool Cementitious Finish

1.4 QUALITY ASSURANCE

A. Reference Standards: Conform to the following standards unless otherwise required herein.

1. American National Standards Institute (ANSI)

a. A108.01 – General Requirements: Subsurfaces and Preparations by Other Trades.

b. A108.02 – General Requirements: Materials, Environmental, and Workmanship.

c. A108.1, Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile installed with Portland Cement Mortar.

d. A108.1C – Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry Set or Latex-Portland Cement Mortar.

e. A108.5 – Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

f. A108.6 – Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy for the Epoxy Grouting Installation Process.

g. A108.10 – Installation of Grout in Tile Work.

h. A137.1 Standard Specifications for Ceramic Tile.

2. American Society for Testing and Materials (ASTM)

a. C144-99, Aggregate for Masonry Mortar

b. C150-00, Portland Cement

c. C171-97a, Sheet Materials for Curing Concrete

d. C206-97, Finishing Hydrated Lime

e. C207-91 (R1997), Hydrated Lime for Masonry Purposes

f. F-1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

g. F-2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes

3. Tile Council of North America (TCNA); 2013 Edition, Handbook for Ceramic Tile Installation.

4. International Standards Organization (ISO)

a. ISO 13007 – Part 1: 2004 Ceramic Tiles – Grouts and adhesives; specifies the value of performance requirements for all tile adhesives.

b. ISO 13007 – Part 2: 2005 Ceramic Tiles – Grouts and adhesives; test method for adhesives.

c. ISO 13007 – Part 3: 2005 Ceramic Tiles – Grouts and adhesives; terms, definitions and specifications for grout.

d. ISO 13007 – Part 4: 2005 Ceramic Tiles – Test methods for grout.

5. American Concrete Institute

a. ACI 302 – Guide for Concrete and Floor Slab Construction

6. International Concrete Repair Institute (ICRI)

a. Concrete Surface Profile (CSP)

B. Tile installers shall have two years experience in similar pool projects which the Owner may require written proof thereof and proper tools to install tile.

1.5 MANUFACTURERS

A. Subject to compliance with requirements provide ceramic tile, mortar and grout of the following manufacturers: American Olean Tile Co. (tile), Dal-Tile Co. (tile), Buchtal (tile), KlinkerSire (tile), Mapei Corp. (thin-set, waterproofing, grout and admixtures), and Laticrete International Inc. (thin-set, waterproofing, grout and admixtures) or approved equal.

1.6 SUBMITTALS

A. Submit shop drawings indicating tile layout, patterns, joint layout, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds and setting details.

B. Submit product data indicating material specifications, characteristics, and instructions for using adhesives and grouts.

C. Samples:

1. Mount tile and apply grout on 24 x 24 inch backerboard to indicate pattern, color variation and grout joint size variations of each pattern. Furnish mounted tile samples as requested by the architect/owner.

D. Submit manufacturer's installation instruction.

E. Submit maintenance data.

1. Include recommended cleaning and stain removal methods, cleaning materials.

1.7 PRODUCT DELIVERY AND STORAGE

A. Deliver tile materials to site in unopened factory containers sealed with grade seals bearing printed name or manufacturer and the words "Standard Grade". Keep the grade seals intact and containers dry until tiles are used. Keep cementitious materials dry until used.

1.8 JOB CONDITIONS

A. Inspect and verify job conditions. Report all defects in base surfaces for correction before proceeding.

B. Maintain a temperature range of 40 degrees Fahrenheit to 90 degrees Fahrenheit during installation of tile and grout materials. Tile installation should cure for a minimum 14 days with average an temperature of 70 degrees, while maintaining the minimum 40 degrees and maximum 90 degrees Fahrenheit, prior to filling pool with water.

C. Vent temporary heaters to outside to avoid carbon dioxide damage to the new tile work.

1.9 COLORS

A. Colors to be selected by the Architect or Interior Designer. Note that swimming pool regulations may dictate color selections within the pool tank. See 2.01 Tile Materials for price group breakdowns.

1.10 WARRANTIES

A. The CONTRACTOR warrants to the Owner that materials and equipment furnished under the contract will be of good quality and new unless otherwise required or permitted by the contract documents, that the work will be free from defects not inherent in the quality required or permitted and that the work will conform with the requirements of the contract documents. Work not conforming to these requirements including substitutions not properly approved and authorized, may be considered defective. The CONTRACTOR'S warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation, modifications not executed by the CONTRACTOR or improper wear and tear under normal usage. If required by the Owner, the CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of five years, unless otherwise specified.

B. All setting materials shall be provided by the same manufacturer. All mixing materials and application procedures shall be done in accordance with manufacturer's recommendations and requirements. Documentation shall be provided to this effect by the contractor with verification from the manufacturer. This documentation shall be included in the operations and maintenance manual under warranties as

documentation qualifying the project for a 15 Year Systems Warranty by Laticrete International, Inc., Mapei, Inc. or approved equal.

C. The CONTRACTOR shall agree to repair or replace any work at no cost to the Owner upon written notification from the Owner within the warranty period. Pro-rated warranties are not acceptable.

PART 2 - PRODUCTS

2.1 TILE MATERIALS

A. Standard grade conforming to ANSI A137.1. Provide trimmer units as indicated and specified, including special shapes as detailed or required. Tile patterns and colors shall be as indicated and specified, colors of approved shades. Mesh mounted or perforated paper backed tile is not allowed where the mesh of paper remains as a permanent part of the installation. If dot mounting is used, a minimum of 67% of the depth of the tile shall be free from any dots to ensure proper grout curing.

B. Unglazed Ceramic Mosaic Tile

1. Slip-resistant porcelain unglazed ceramic mosaic tile, cushion or all-purpose edges, two-inch square from price group 2 for floor, walls, and stair treads unless otherwise noted. Minimum dynamic coefficient of friction shall be 0.42 for wet surfaces and 0.65 for ramped surfaces. Where (special shapes) are required they shall be selected from price group 3. Equivalents provided by Knoxtile, Dal-Tile or American Olean. For wet surfaces: Buchtal Chroma Mosaics with front mount film (seven color options) 2x2 7161HVF or American Olean Unglazed color-body porcelain mosaics 2”x2”, price group 1-3. For ramps: Buchtal Chroma non-slip mosaics with glass fiber net (four color options) 2x2 7161H. Or for wet surfaces or ramps: Buchtal Chroma non-slip 5x5 32020H thirteen color options) or Dal-Tile or American Olean Unglazed color-body mosaics 2”x2” with 7.5% abrasive grain (7 color options). All colors to be selected by the architect.

2. Ceramic tile band below the pool gutter lip, and recessed steps shall be selected by Architect from Dal-Tile, Keystone Unglazed Mosaic, 2” x 2” price group 4, American Olean Unglazed color-body porcelain mosaics 2”x2” price group 1-3, or powder glazed 2x2 Buchtal Chroma Mosaics provided by Knoxtile.

3. Ceramic tile deck band that contains the depth marker letters and numerals shall be selected by the Architect from Dal-Tile, Keystone Unglazed Mosaic, 2”x2”, price group 4, American Olean Unglazed color-body porcelain mosaics 2”x2”, price group 1-3.

4. The 15-meter resurfacing marker shall be ceramic tile selected by the Architect from Dal-Tile, Keystone Unglazed Mosaic, 2”x2”, price group 4, American Olean Unglazed color-body porcelain mosaics 2”x2”, price group 1-3. The color of the resurfacing marker shall be contrasting with the tile deck band.

5. Contrasting ceramic tile nosings at recessed steps and toe ledge, shall be selected by the Architect from Dal-Tile, Keystone Unglazed Mosaic, price group 3 and 4, American Olean Unglazed color-body porcelain mosaics 2”x2”, price group 1-3, or Safety Edge Tile from Inlays, Inc.; Black CPC00022, Blue CPC00021.

6. 12” lane markers on the pool floor shall be selected by Architect from Dal-Tile, Keystone Unglazed Mosaic, 2”x2” price group 3, American Olean Unglazed color-body porcelain mosaics 2”x2” price group 3, or from Knoxtile, as 4x4 Buchtal Chroma Colors 22010H-717, 5556 Grey Black and 5535 Blue or 2x2 Mosaic 7160HVF 5535 Grey Black. The main race course wall targets and lane markers shall be black. The cross course wall targets and lane markers shall be contrasting dark color selected by Architect.

C. Handhold Tile at pool perimeter shall be provided as Buchtal available from Knoxtile. Architect to select colors.

1. Hand-hold tiles at the pool perimeter shall be Buchtal Chroma Handhold Edge from Knoxtile: System Finland 119x244 mm (5x10 in) 900402-55730 White with Dark Blue Safety Strip, Internal Corners (pair) 112x112 mm 900402-55732 White with Dark Blue Safety Strip, External Corners 240x119mm 55736-900402 White with Dark Blue Safety Strip.

2. System Finland 119x244 (5x10 in) 55730-900044 White with Black Safety Strip, Internal Corners (pair) 112x112 mm 55732-900044 White with Black Safety Strip, External Corners 240x119mm 55736-900044 White with Black Safety Strip.

D. Provide tile trim units where indicated or necessary for a complete and finished installation. Provide rounded units for external and internal corners and angles. Provide trim units of material and finish identical to the adjoining tile. Provide SCR/L701 units where the C701 hand hold is interrupted to permit draining. Contractor should request via non-standard production. The SCR/L701 units are available through DalTile at 314-997-6970 or 1-800-672-2086.

E. Message Tile and Depth Markings

1. Horizontal and vertical depth markings and warning signs shall be 6" x 6" with 4" high numbers and letters. All horizontal depth markers shall be slip resistant. Single tile abbreviations shall be used for 'FT' and 'IN'.

2.2 SWIMMING POOL TILE SETTING MATERIALS AND INSTALLATION

A. Surface Preparation

1. Surface preparation shall be in accordance with ACI 302. The surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion. Sound and remove all loose concrete to firm substrate. Surfaces shall be roughened to a CSP of 3 to 5 (reference ICRI CSP Standards 7 to 9 for acceptable profile height). Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations.

B. Slurry Bond Coat

1. Horizontal surfaces to receive a thick bed mortar application shall be installed over a slurry bond coat of either Laticrete 254 Platinum one-step, polymer-fortified, thin-set mortar, or Mapei 4:1 bag mix with Planicrete AC Additive over a clean concrete slab, in compliance with ANSI A108.1A (2.2 & 5.2). As manufactured by Laticrete International, Mapei, Inc., or approved equal. Note that slurry bond coats are not required under vertical applications of the render and scratch coat.

C. Mortar & Leveling Beds

1. **Bonded Thick Bed Method (Floor / Horizontal Surfaces)**: Provide a dry pack, thick mortar bed on horizontal surfaces consisting of either Laticrete 3701 Fortified Mortar Bed, or Mapei, 4:1 bag mix with Planicrete AC Additive. Apply over a properly prepared slurry bond coat. Maximum lift thickness not to exceed 2".

2. **Render- Scratch and Float Coats (Wall / Vertical Surfaces):** Provide wall render (scratch and float coats) on vertical competition turning surfaces to a depth of 4 feet below the water surface, consisting of either Laticrete 3701 Fortified Mortar Bed, or Mapei, 4:1 bag mix with Planicrete AC additive for lift thicknesses up to ½". Wall render is made to a plastic consistency when used vertically. Fill all holes and bring surface up to line and plane as required. As manufactured by Laticrete International, Mapei, Inc. or approved equal. Note that slurry bond coats are not required under vertical applications of the render and scratch coat. (Refer to Course Length Tolerances for competitive pools.)

D. Tile Thin-Set

1. Use either Laticrete 254 Platinum one-step, polymer fortified, thin-set mortar or Mapei Ultraflex 3 one-step, polymer modified, thin-set mortar, used in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Mapei, Inc., or approved equal.

E. Tile Grout

1. Use either Laticrete Spectra LOCK Pro Premium Grout or Mapei Kerapoxy CQ Grout in accordance with the manufacturer's requirements as manufactured by Laticrete International, Mapei, Inc. or approved equal.

F. Elastomeric Sealant

1. Use Laticrete Latasil sealant for all inside/outside corners, expansion/movement joints, and to seal lighting/plumbing fixture penetrations. Apply sealant over Latasil 9118 primer. All primer and sealant installation shall be in accordance with the manufacturer's requirements. As manufactured by Laticrete International, Inc., or approved equal.

G. All mixing and application procedures shall be done in accordance with the manufacturer's recommendations and requirements. The manufacturer's representative shall visit the site to verify field conditions, confirm materials and application requirements and ascertain that all materials and systems are so installed. Documentation shall be provided to this effect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Complete water tightness test prior to tile installation. Concrete tank shall be watertight per ASTM D5957, the Tile Council of North America, and specification 131100.

B. Clean substrates of dust, dirt, oil, grease and deleterious substances and mechanically roughen concrete and shotcrete for bond. Conform to applicable reference standards and to recommendations of manufacturers of materials used and meeting ICRI, CSP of 3-5.

C. Substrates to Receive Mortar Setting Beds

1. Dampen concrete substrate to receive tile work according to above referenced standards or tile manufacturer's instructions, as required.

D. Substrates to receive thin set tile applications shall meet normal construction tolerances of 1/4" in 10' where competition tolerances do not apply, and shall meet competition tolerances where required elsewhere in these specifications, and shall be free of bumps, dips and surface irregularities that may effect the satisfactory installation of the tile.

E. Tile Wetting

1. Dampen tile according to above reference standards or tile manufacturer's instructions, as required.

F. Screeds

1. Accurately set temporary screeds to control the finish plane of mortar-bed set tile and remove as soon as setting bed is sufficiently hardened. Fill void spaces from screeds with same mortar.

3.2 TILE INSTALLATION

A. Arrange tile according to patterns detailed. Set tile with flush well-fitted joints, finished in true planes, plumb, square, joints of uniform size. Provide approved trimmers as shown or required. Cut tile without marring. Carefully grind and joint tile edges and cuts.

B. Follow Tile Council of North America installation methods P601 and B417 to achieve total tile system thickness for thin or thick-set.

1. Thick Set

a. Apply specified setting bed mortar, up to 2” in thickness, on cured and dried concrete pool shell. Tamp and screed to required planes. Spread no more mortar than can be covered with tile before initial set. Do not use re-tempered mortar. Trowel 3/32” to 1/8” thick bond coat over plastic setting bed mortar just before setting tile or apply bond coat to back of each tile placed. 95% coverage of the back of the tile or tile sheet is required. Set tile in position and beat firmly into the setting bed mortar. Bring tile faces to a true and correct plane. Complete all beating and leveling before mortar sets and in no case later than one hour after first placing. When ready, wet and remove paper and glue avoiding excess water. At this time adjust any out-of-line or out-of-level tile.

2. Thin Set

a. Apply specified bond coat on cured and dried concrete pool shell. Trowel 3/32” to 1/8” thick bond coat over concrete pool shell just before setting tile or apply bond coat to back of each tile placed. 95% coverage of the back of the tile or tile sheet is required. Set tile in position and beat firmly into the setting bed mortar. Bring tile faces to a true and correct plane. Complete all beating and leveling before mortar sets and in no case later than one hour after first placing. When ready, wet and remove paper and glue avoiding excess water. At this time adjust any out-of-line or out-of-level tile.

C. Finished tile surface shall be level and in plane, with no sharp or protruding edges. Tiles out or plane more then 1/16" shall be removed and replaced. Sharp edges shall be stoned smooth.

D. Grout Joint Sizes

1. Unless otherwise approved, install tile with uniform 3/32 inch joint width. A maximum 1/8" joint width may be utilized to meet specific installation requirements, if required.

E. Ceramic Tile Joint Grouting

1. Mix grout to a thick creamy consistency and force into joints for entire thick depth, flush with surface. Clean off all excess and fill skips and gaps before grout sets. Color selection by Architect or Interior Designer. Provide dampness for minimum 3-day curing and polish with clean dry cloths (not required when epoxy grouts are used).

F. Expansion Joints

1. Place expansion joint per applicable TCNA Method P601MB, P601TB, or P602 and conforming to Method EJ171. Provide shop drawings showing backer rod and joint dimensions. All expansion, control, construction, cold, and seismic joints in the pool structure should continue through the tile work, including such joints at vertical surfaces. Movement joints shall be placed at all changes in direction and elevation. Refer to the structural engineer for additional required movement joints. Joint size shall be a minimum of 1/8”. Joints through tile work directly over structural joints shall not be narrower than the structural joint. The Contractor shall use cement compatible coatings when using chalk lines for joint layout purposes.

G. Fill and Empty Rates

1. Use a fill and drain rate of 2 feet per 24 hours to minimize thermal shock and structural movement. Maintain a temperature differential of 10 degrees Fahrenheit or less between the pool water and the substrate during fill and drain cycles.

3.3 TESTING AND INSPECTION

A. Before filling of the pool, and its subsequent provisional acceptance at substantial completion, the tile installation shall be visually inspected and sounded in the presence of the Architects and/or the Owner's representative to verify adhesion of the tile to its substrate as well as its overall compliance with the requirements of this Section.

B. Any and all tile work found to be loose, improperly adhered, out of plane, misaligned or otherwise non-conforming shall be removed and replaced at no additional cost to the Owner.

3.4 CLEANING

A. Upon completion of placement and grouting, clean tile installation as recommended by TCNA and manufacturers of proprietary materials. Tile shall be cleaned with pH neutral solutions, free of both sodium and potassium, in accordance with the tile and grout manufacturer's printed instruction.

B. Leave finished installation clean and free of cracked, chipped, broken, un-bonded or otherwise defective tile work.

C. Protect installed tile work with non-staining Kraft paper, polyethylene sheeting, or other approved heavy covering during the construction period to prevent damage.

3.5 REPLACEMENT TILE

A. Provide Owner with approximately 10% or 25 square feet (whichever is least) of each color and type tile used on the project for Owner's repair and replacement requirements.

END OF SECTION

SECTION 131104
SWIMMING POOL CEMENTITIOUS FINISH

PART 1 - GENERAL

1.1 SUMMARY

a. Provide a conventional proprietary aggregate plaster finish, to the pool structure(s). Provide installation of bond coat prior to application of pool finishes. A ceramic tile trim shall be furnished and installed on the pool perimeter tile band, vertical tile band, nosings, recessed wall steps, depth markings, wall targets, floor lane markings and all other tile installations as shown and detailed on the contract drawings and in strict accordance with these specifications.

b. Provide water analysis and pre-fill requirements.

1.2 SUBMITTALS

a. Samples

1. Prepare 12-inch square panel at the site showing color and texture for pool plaster. Finished cementitious finish work shall match the approved sample panel.

b. Certificates

1. Submit certificates attesting that the materials furnished meet the requirements specified herein.

c. Test Report

1. Submit results of domestic water analysis and calculation of amounts of chemicals required to balance pool water on initial fill of pool.

1.3 PRODUCT DELIVERY AND STORAGE

a. Deliver manufactured materials to site in manufacturers' original unbroken packages or containers bearing manufacturers' name and brand labels. Keep cementitious materials dry until ready to be used and stored off the ground, under cover and away from damp surfaces.

1.4 JOB CONDITIONS

a. Apply plaster in swimming pool only when ambient temperature is above 40 degrees F and below 90 degrees F, and protect applied plaster from rapid drying by sun or wind until curing is completed or pool is filled with water. Confirm and comply with all applicable manufacturers installation requirements.

1.5 QUALITY ASSURANCE

a. Plaster installers shall have two years experience in similar pool projects which the Owner may require written proof thereof and proper tools to install plaster.

1.6 SURFACE PREPARATION

a. Surface Preparation

1. Surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion, free of dirt, oil, grease or other foreign materials. Sound and remove all loose concrete

to firm substrate. Surfaces shall be roughened by sand blasting, water jetting, shot blasting, scarifying, or grinding. Pressure-wash the entire surface. Wash with trisodium phosphate (TSP) using a stiff broom. Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations.

2. Apply and cure bond coat per manufacturer's recommendations. After proper curing of bond coat, lightly moisten with clean potable water prior to application of cementitious finish. Ensure bond coat is free of any foreign matter prior to plastering.

PART 2 - PRODUCTS

2.1 DIAMOND BRITE

A. The CONTRACTOR shall install a slip-resistant proprietary plaster finish in the areas indicated on the drawings. Description: Diamond Brite finish shall be a blend of selected quartz aggregates and fortified white Portland cement. Color and texture shall be selected by the Architect. Confirm all installation requirements with the manufacturer.

B. Bond Coat

1. Bond Kote by SGM, Inc., or approved equal. Apply and cure bond coat per manufacturer's recommendations. After proper curing of bond coat, lightly moisten with clean potable water prior to application of cementitious finish. Ensure bond coat is free of any foreign matter prior to plastering.

C. Mixing

1. Thoroughly mix Diamond Brite to a homogeneous lump-free consistency using 1-1/2 to 2 gallons of potable water per 80 lb. bag.

D. Application

1. Diamond Brite shall be applied to a uniform thickness of 3/8" to 1/2" over the entire surface. The walls shall be scratch-coated followed by a finish coat. Material applied to the floor after the walls have been applied shall be accelerated to assure uniform setting time throughout the pool surface.

E. Coverage

1. Each 80 lb. bag shall cover approximately 25 square feet to a thickness of 3/8".

F. Proprietary plaster finish is to be applied by a licensed applicator as approved by the manufacturer.

2.2 PEBBLE SHEEN

A. The CONTRACTOR shall install a slip-resistant pebble stone surface in the areas as indicated on the drawings. Description: Pebble Sheen finish shall be a blend of selected colored aggregates and fortified white Portland cement. Color and texture shall be selected by the Architect. Finish to consist of Pebble Sheen as supplied by Pebble Technology, Inc. (480) 948-5058, or approved equal. Confirm all installation requirements with the manufacturer.

B. Surface Preparation

1. Surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion, free of dirt, oil, grease or other foreign materials. Sound and remove all loose concrete to firm substrate. Surfaces shall be roughened by sand blasting, water jetting, shot blasting, scarifying, or grinding. Pressure-wash the entire surface. Wash with trisodium phosphate (TSP) using a stiff

broom. Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations. Lightly moisten walls and floors prior to application of Pebble Sheen.

C. Bond Coat

1. Scratch Kote System by Multicoat Corporation, Bond Kote by SGM, Inc., or approved equal. Apply and cure bond coat per manufacturer's recommendations. After proper curing of bond coat, lightly moisten with clean potable water prior to application of cementitious finish. Ensure bond coat is free of any foreign matter prior to plastering.

D. The cement-pebble stone mixture is to be pneumatically applied to the pool surface.

E. After application of Pebble Sheen material the surface is to be hand troweled for exposure of pebble material.

F. Spray down troweled surface with water to remove excess cement and exposure of pebbles.

G. Surface is allowed a minimum of a 24 hour hardening period. Upon hardening the surface is cleansed with an approved solution as provided by the manufacturer for final exposure and luster of pebble surface.

H. Surface is to be buffed so as to ensure all sharp edges are removed and final surface texture is per the manufacturer's recommendations.

I. Natural pebble stone surface is to be applied by a licensed applicator as approved by the manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES AND BOND COAT

A. Clean base surfaces of projections, dust, loose particles, grease, bond breakers, and foreign matter; make sufficiently rough to provide a strong mechanical bond. Sandblast, acid etch, or waterblast to achieve appropriate profile. If acid etching, surfaces must be neutralized and powerwashed prior to proceeding. Do not apply cementitious finishes directly to the surfaces of masonry or concrete that is coated with any acidic solution compound or similar agent until compound or agent is completely removed by water blasting. Thoroughly wash entire surface with 2,000 psi high-pressure water immediately prior to application of finishes. Wet cementitious base surfaces with a fine fog water spray to produce a uniformly moist condition and check screeds, pool equipment, and accessories for correct alignment before work is started. Do not apply finish materials to base surfaces containing frost. Install temporary coverings as required to protect adjoining surfaces from staining or damage by plastering operations.

B. Prepare and clean concrete surfaces by removing oil or grease. Repair all cracks, surface damage as required prior to proceeding. Protect or mask all adjacent surfaces that are not scheduled to receive cementitious finish. If expansion or construction joints exist in the areas where cementitious finish will be applied cover plastic joints for protection (if plastic joints are used). Additionally, mark joints for saw-cutting if area will be saw-cut.

C. Apply and cure bond coat per manufacturer's recommendations. After proper curing of bond coat, lightly moisten with clean potable water prior to application of cementitious finish. Ensure bond coat is free of any foreign matter prior to plastering.

D. Contractor to thoroughly verify the site conditions prior to the application of cementitious finish. Verify concrete is free of ridges and sharp projections. Verify that all concrete surfaces that are to receive a cementitious finish have cured for a minimum of 5 days. Consideration should be given for the application of a primer for all concrete structures that is over 28 days old to improve bonding.

3.2 APPLICATION OF CEMENTITIOUS FINISH

A. General

1. Confirm all application requirements with the manufacturer. Apply finish plaster to the properly prepared substrate at the minimum thickness required by the manufacturer, but no less than 3/8 inch thickness at any location. Apply finish plaster by hand or machine. If plastering machine is used, control fluidity of plaster to have a slump not exceeding 2-1/2 inches when tested using a 2" by 4" by 6" high slump cone. Do not add additional water to the mix subsequent to determining water content to meet this slump. Perform slump test according to following procedure:

   a. Place cone on level, dry non-absorptive base plate.

   b. While holding cone firmly against base plate, fill cone with plaster taken directly from hose or nozzle of plastering machine, tamping with a metal rod during filling to release all air bubbles.

   c. Screed off plaster level with top of cone. Remove cone by lifting it straight up with a slow and smooth motion.

   d. Place cone in a vertical position adjacent to freed plaster sample suing care not to jiggle base plate.

   e. Lay straightedge across top of cone being careful not to vibrate cone; measure slump in inches from bottom edge of straightedge to the top of slumped plaster sample.

2. All mixing of materials and application procedures shall be done in accordance with the manufacturer's recommendations and requirements. The manufacturer's representative shall visit the site to verify field conditions, confirm materials and application requirements and ascertain that all materials and systems are so installed. Documentation shall be provided to this effect.

B. Workmanship

1. Unless otherwise required by the manufacturer, apply finish plaster in two coats by "double-back" method with second coat applied as soon as first coat is tamped and initially floated. Apply plaster with sufficient pressure to provide a good bond on bases. Work plaster to screeds at intervals of from 5 feet to 8 feet on straight surfaces. Apply smooth trowel finish without waves, cracks, trowel marks, ridges, pits, crazing, discoloration, projections, or other imperfections. Form plaster carefully around curves and angles, well up to screeds. Take special care to prevent sagging and consequent drooping of applications. Produce surfaces free of visible junction marks in finish coat where one day's work adjoins another. Finish proprietary plaster as required by the manufacturer.

2. All cementitious finishes shall be applied by a licensed applicator as approved by the manufacturer.

C. Curing

1. Curing cementitious finishes with fine fog water spray applied to finish coat as frequently as required to prevent dry-out of surface, or as directed by the manufacturer of the cementitious finish. Keep plaster damp until pool is filled. Prevent damage or staining of plaster by troweling or curing.

D. Patching, Pointing, and Cleaning Up

1. Upon completion, cut out and patch loose, cracked, damaged, or defective plaster; patches matching existing plaster in texture, color, and finish, flush with adjoining plaster. Perform pointing and patching of surfaces and plasterwork abutting or adjoining any other finish work in a neat and workmanlike manner. If 10 percent or more of the pools plaster finish is found to be defective, the plaster shall be removed and replaced complete from all surfaces. Remove plaster droppings or spattering from all

surfaces. Leave plaster surfaces in clean, unblemished condition ready for pool filling. Remove protective coverings from adjoining surfaces. Remove rubbish and debris from the site.

3.3 PRE-FILL SPECIFICATION

A. Contractor shall employ a qualified water testing agency to analyze the domestic water with which the pool will be filled within 2 weeks of the plaster date, and shall employ a swimming pool experienced water chemistry consultant to determine types and quantities of chemicals required to ensure calcium-balanced water immediately upon the completion of water filling. Refer to section 131100 for water filling requirements.

1. Have on hand quantities of the chemicals as determine above, plus 25% overage for follow-up treatment. These chemicals, typically including calcium chloride, bicarbonate of soda, and muriatic acid are in addition to standard bromine/chlorine products and alkalizer/pH control products required elsewhere.

B. The pool(s) shall not be plastered until directed by the Owner's representative and the filtration system and chlorination system are complete and ready for start-up. The Contractor shall supply all chemicals required for treatment of the pool water.

C. The Contractor shall submit domestic water analysis to the Owner and/or Architect at least 2 weeks prior to filling the pool(s).

END OF SECTION

SECTION 131106
SWIMMING POOL TIMING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.2 SUMMARY OF WORK

A. Introduction

1. Provide all labor, materials, equipment and services necessary to install a complete electronic timing and scoreboard system with multi-sport capability for race swimming, diving, water polo, pace clock, and synchronized swimming.

B. Work included in this section

1. It is the intent of this section to place the entire responsibility for the complete electronic timing and scoreboard system (including all appropriate connections) with multi-sport capability under one vested supplier. The supplier is responsible for providing full integration of this system. Multiple suppliers for a system will not be approved.

C. Related work specified in Electrical sections. Reference Division 26 – Electrical. Work to be completed by other contractors.

1. Ground and bond all pool structures, fittings and equipment in accordance with Article 680 of the N.E.C. Test and verify that the system electrical ground is true and solid. Provide certification to this effort.

2. Obtain permits, inspections, and approvals of all wiring including grounding and bonding of all metal components associated with the pool in accordance with Local, State and National Electrical Codes.

3. Install power, conduits, electrical boxes, ethernet connections and wiring for the Contractor furnished electronic timing and scoreboard system with multi-sport capability for race swimming, diving, water polo, pace clock, and synchronized swimming.

4. Supply junction boxes for all equipment outlined in these specifications and depicted on the timing system drawings.

D. Basis of Design:

1. The complete electronic timing and scoreboard system with multi-sport capability is based upon Colorado Timing System, Inc.

1.3 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

A. Colorado Time Systems, Inc., 1551 East 11th St., Loveland, CO 80537, 970-667-1000. (Basis of Design.)

1.4 SUBMITTALS

A. Submittals shall include the following:

1. Product data

2. Shop drawings detailing system layout

3. Operations and maintenance manuals for system. Manuals shall include a complete parts list.

4. Warranty for each piece of equipment within this section.

1.5 JOB CONDITIONS

A. Manufacturers proposing to submit a quotation for the electronic timing and scoreboard system must confirm that all embedded items are compatible with the installation of their respective systems.

B. Manufacturers shall review the construction documents and shall notify the architect 10 days prior to the bid date of conflicts or additions to the work of other subcontractors for the proper installation of their system.

1.6 WARRANTIES

A. The CONTRACTOR shall warranty the completed installation of all systems in this section for one year.

B. The manufacturer shall warranty the scoreboard, computer consoles, touchpads, pace clocks and starting system for two years.

C. The manufacturer shall warranty the titanium timing system wall plate and deck plates for five years.

PART 2 -PRODUCTS

2.1 SCOREBOARD SYSTEM

A. LED Numeric Scoreboard System (One (1) required - Located at DIVE POOL)

1. Multi-Sport LED Scoreboard system shall display all necessary information for diving in compliance with the appropriate sanctioning body - USA DIVING, NCAA, and NFHS.

   a. Basis of Design: Multi-Sport LED Scoreboard System is based upon Colorado Timing System, Inc.

2. Each line of scoreboard shall use seven segments 10” high LED digits, red color.

3. Each line of scoreboard shall have an internal data selector switch to permit owner/operator selection of data codes to be installed at each line of scoreboard. Data select codes may be manually changed at the scoreboard or logically changed from the timer console. Scoreboards with fixed function displays are unacceptable.

4. Each line of scoreboard can have up to eight operable digits, eight operable decimals, and one operable colon to provide maximum display flexibility and reduced cost. Scoreboards with fixed decimals and colons are unacceptable.

5. Each line of scoreboard shall have an individual internal power supply and individual control circuit to limit loss of data to one line if a malfunction should occur or to permit its use as an independent line of scoreboard.

6. Each line of scoreboard shall have true multi-sport capability through the use of sliding digits to permit reformatting to desired configurations. Digits shall move freely without the use of hand tools.

7. Each line of scoreboard shall be constructed identically (modular) to permit on-site substitution or replacement of failed unit.

8. The scoreboard shall be capable of being used in a time of day mode when not being used in display modes.

9. Power shall be 115VAC, 2 amp, 250 watts per module maximum.

10. Facility name panel(s) shall be provided per Architect.

11. Scoreboard shall display the following minimum requirements:

7 Line Scoreboard	Lead Diver, Current Diver, DD, Round, Award Judges scores up to 10 judges, Award Point to overtake leader

B. Full Color Video Display (two (2) required, as located in plan)

1. Full Color Video Display system shall display all necessary information to time swimming, diving, water polo, and synchronized swimming in compliance with the appropriate sanctioning body - FINA, USA SWIMMING, NCAA, and NFHS.

   a. Basis of Design: Multi-Sport LED Scoreboard System is based upon Colorado Timing System, Inc.

2. Display shall include: Full matrix LED scoreboard with computer controller, flat-wall mounting hardware and data/fiber cable up to 500'.

3. Display shall be a full color LED matrix display. Display shall be comprised of red, blue and green LEDs to form pixels. Display shall be capable of 281 trillion shades of color.

4. Display should be capable of 16-bit video processing, refresh rate of 240Hz, four levels of dimming capability and allow for Gamma correction.

   a. Display intensity shall be adjustable between 562-1500 nits for INDOOR.

5. The display shall have a built-in graphics and animation capability with Windows- based software. Graphics and animation shall have the capacity of being displayed on the entire matrix. All MS Windows fonts shall be compatible with the display.

6. Display must have the ability to show live video or DVD's.

7. Display shall allow for front access points for service.

8. Display shall include 2% spare critical parts.

9. Operation temperature shall be between 14F – 140F (-10c – 60c).

10. Humidity tolerance shall be between 0%-95%.

11. Each indoor pixel shall be comprised of 3 LED's 1R1G1B..

12. Scoreboard Details:

   a. MAIN SCOREBOARD (Located on West End wall of 50M pool)

i. Minimum Viewing Distance: 50 ft to 150 ft.

ii. Pixel Spacing: 10 MM

iii. Active Area: 9.45(H) x 26.25(W)

iv. Pixel configuration shall be: 288 PIXELS HIGH x 800 PIXELS WIDE

b. SECONDARY SCOREBOARD (Located across 50M pool)

i. Minimum Viewing Distance: 50 ft to 150 ft.

ii. Pixel Spacing: 10 MM

iii. Active Area: 9.45(H) x 16.78(W)

iv. Pixel configuration shall be: 288 PIXELS HIGH x 512 PIXELS WIDE

C. Scoreboard Hanging Requirements

1. Scoreboard manufacturer shall provide drawings with hanging information.

a. Material: Scoreboard hangers shall be 316L stainless steel for an indoor natatorium.

b. Coordinate scoreboard hanging requirements with structural engineer prior to the submittal process.

2. Anchors

a. Metal studs with 5/8" Magnesiacore panels on walls

1) Refer to structural for specific anchoring fastener requirements to metal stud wall system.

3. Supports

a. Unistrut (LED Board)

1) Material

a) Fittings, unless noted, are made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel also meets the physical requirements of ASTM A1011 SS GR 33. The pick-ling of the steel produces a smooth surface free from scale. Many fittings are also available in stainless steel, aluminum and fiberglass. Consult factory for ordering information.

2) Finishes

a) Fittings are available in: Perma-Green III (GR), Electro-galvanized (EG), conforming to ASTM B633 Type III SC1; Hot-dipped galvanized (HG), conforming to ASTM A123 or A153.

b. Unistrut (Numeric Board)

1) Material

a) Unistrut channels are accurately and carefully cold formed to size from low-carbon strip steel. All spot-welded combination members, except P1001T, are welded 3" (76 mm) maximum on center.

2) Finishes

a) All channels are available in Perma Green III (GR), Pre-galvanized (PG) conforming to ASTM A653 G90, Hot-dipped galvanized (HG) conforming to ASTM A123.

4. Brackets

a) Per ANSI B1.1- Surface roughness per ANSI B46.1- Surface roughness on holes 250 MAX unless otherwise specified. Variations in form from unmachined features are permitted within established – all filets 0.005-0.020 (APPROX. RADIUS) – Screw threads per ANSI B1.1- Pipe threads commercial standards. All edges and corners 0.005-0.020 (approx. radius or chamfer).

b) All materials and components used in the assembly of this item must be RoHS complaint material: 12GA (.105) HRS. The finish shall be ZINC CLEAR CHROMATE PLATED. Manufacturer shall break all sharp edges and corners.

c) All support hardware, brackets, fasteners, hangers, etc. used during installation of the scoreboard shall be Zinc Clear Chromated Plated.

2.2 MULTI-SPORT COMPUTER/TIMING SYSTEM

A. Multi-Sport Computer/Timing System shall be supplied with all necessary software to time swimming, diving, water polo, and synchronized swimming in compliance with the appropriate sanctioning body - USA SWIMMING, NCAA, and NFHS.

1. Basis of Design: Multi-Sport Computer/Timing System is based upon the GEN7 TIMING as manufacturer by Colorado Timing System, Inc.

B. Multi-Sport Computer/Timing System shall be a standalone unit with physical connections to timing inputs. Timer shall be controlled by user interface device (e.g., computer, tablet, etc.) via USB or TCP/IP.

1. Timer PC or tablet interface device shall be supplied with all necessary software to time and score swimming in compliance with the appropriate governing organization(s) - USA SWIMMING, NCAA, and NFHS.

2. Configuration of race courses shall be through graphical user interface. It is unacceptable that race configurations need specific cable connections to system connections such as wall plates defining a specific end of a course.

3. User interface shall display complete race status. The interface shall be capable of functioning as miniature scoreboard displaying information simultaneously for all active lanes including lane number, current length in race or final place, split or finish time, relay judging status indicator, and backup time and backup button status.

4. Timer shall automatically flag timing discrepancies (in the user interface, on the results printouts and in stored memory) greater than a user defined interval between touch pad and backup times.

C. Multi-Sport Computer/Timing System input/output ports must include:

1. Shall accept inputs for up to 4 courses of up to 32 lanes each for a serial in-deck wiring installation and shall be able to time them simultaneously.

2. Up to 8 timers shall be supported to accept inputs of the same in-deck wiring installation for parallel race timing and backup.

3. Shall accept on-deck cable harness inputs for up to 20 lanes near end and/or far end.

4. Shall communicate with meet management peripheral software on a two-way “handshake” basis, enabling the meet manager’s resident computer to query the timer’s memory via the USB port or via the network at any time for any race results.

5. Shall provide backup time via push button provided on a per lane basis should swimmer fail to trigger touch pad or touch pad fail to register. Timer to be capable of accepting up to three backup button times per lane.

6. Shall automatically compare the touch pad hit of an incoming swimmer with the starting swimmer’s time of departure from the optional relay-judging platform. Results display both “plus” and “minus” takeoff times and can be printed and stored in race memory

D. Accuracy of Multi-Sport Computer/Timing System:

1. Shall time to a user-selectable resolution from 1 second to .001 second. It shall take starts and finishes from the near end and/or far end of the pool. It shall accept inputs from the start system; touch pads, up to three manual button backup times per lane, and relay judging platforms.

2. Shall be able to evaluate and report multiple states of timing component input condition, ranging from excellent to failure. It is unacceptable that only two states such as on or off are reported.

3. Shall have touch pad delay feature with ability to program delays from 1 to 99 seconds.

4. Shall permit the operator to correct for an erroneous touch by adding/subtracting a touch pad hit to correct the lengths completed. The interface shall not permit the operator to finish a race in any lane; timers including such a function are unacceptable because they permit the possibility of cheating.

5. Later recall of stored race data shall allow for a re-run of a given race including changes in user decisions.

E. Multi-Sport Computer/Timing System Detection:

1. Shall be capable of detecting timing components such as pushbuttons, touchpads, RJPs, speakers, Speedlight and start systems connected to an in-deck system and capable of detecting touchpads and RJPs connected to an on-deck system.

2. Shall be capable of reporting corrosion in the in-deck wiring installation.

F. Multi-Sport Computer/Timing System shall run off a 12 Volt power supply connected to a standard 110/240 VAC outlet and will automatically switch to (and display on screen of connected interface device) internal battery power source, in case of line power failure without affecting the continuity and accuracy of the timing system.

G. Multi-Sport Computer/Timing System shall interface to single-line and multi-line scoreboard and shall post immediate results to scoreboard in “Lane” or “Place” order (user selectable). The timer shall also have the capability to pull race results from memory and post those results to the scoreboard in “Lane” or “Place” order (user selectable).

H. Multi-Sport Computer/Timing System shall include internal clock calendar with self-sustaining battery to time/date stamp all results.

I. Multi-Sport Computer/Timing System shall meet acceptable safety standards. Shall be UL approved, or equivalent.

J. Multi-Sport Computer/Timing System Storage and Internal Memory:

1. System shall store each and every timing input state change. It is not acceptable that state changes get discarded and are not available for later re-evaluation of a race.

2. All race data, including near and far end splits, shall be stored to internal memory for later recall to facilitate meet management connectivity and printing. Printed reports shall include cumulative and subtractive splits as well as relay judging times (when required).

3. Meet memory shall be capable of being transferred to external storage (via USB) or cloud data backup services (e.g., DropBox, Google Drive).

K. Multi-Sport Computer/Timing System shall have an Automatic Event Sequencer that is capable of holding both standard and user defined event sequences. The event order will be able to be downloaded from meet management software. The desired order is user selectable. EVENT SEQUENCES with appropriate race distance and race description for high school, college meets, and two “User Defined” meets to permit construction of custom meets, USA SWIMMING, NCAA, and NFHS. When recalled from memory, race distance and descriptions are automatically selected for the operator.

L. Multi-Sport Computer/Timing System shall have a user interface software that permits operation of essential functions including Lane Off/On, Finish Arm, Split Arm, & Print Results directly from the main screen to ensure speed and simplicity of operation during critical race times. The interface shall permit the operator to edit a time when required or to disqualify a lane (DQ), automatically posting it to the scoreboard, and provide automatic re-ranking of results. Any corrections generated by the operator (edit or disqualification) shall be clearly identified on the results printouts.

M. Multi-Sport Computer/Timing System shall include electronic beeper and LED signaling to indicate touchpad, backup button and RJP inputs. Timers which do not allow the user to configure (enable/disable) this feature are unacceptable.

N. Multi-Sport Computer/Timing System connectivity shall include:

1. USB (Type A) port for external storage

2. USB (Type B) port for meet management connectivity

3. USB (Type B) port for user interface computer connectivity

4. Ethernet port for network connectivity

5. 3 independent scoreboard output ports

6. Wireless 2.4GHz scoreboard connectivity

7. Connection for in-deck wiring and two connections for on-deck (near and far end) wiring

8. Start system connection directly to timer

9. External DC power port

O. Multi-Sport Computer/Timing System shall be capable of updating internal software/firmware via Internet connection.

P. Multi-Sport Computer/Timing System software shall have the ability to adjust the intensity of LED scoreboard brightness.

2.3 SWIMMING TIMING SYSTEM CONNECTORS

A. General Description

1. The timing system shall employ topology of a single communication bus to which all timing and connectivity nodes are connected and communicate with each other

2. Connection points shall be production items and not a one off or prototypes

3. Exposed connectors shall feature titanium contacts. They shall be wet pluggable and electrically passive if not connected. No maintenance to prevent corrosion of deck plate connector contacts shall be needed.

4. Self-test capabilities to detect compromised timing bus wire terminations and scoreboard bus wire terminations

B. Wall Plates

1. Wall plates shall be provided as required in the quantities as shown on the drawings. Wall plates shall be the termination point for connections between deck cables, timers, start system, and other wall plates.

a. Basis of Design: Wall plates are based upon TITANIUM SERIAL WALL PLATE as manufactured by Colorado Timing System, Inc.

2. Wall plates must allow for any, or all, of the following connections depending on location and usage:

a. Connection to the timer.

1) Connectivity to all timing courses and one scoreboard bus with one cable connection.

2) Detection of presence or absence of connected timer.

3) Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts).

b. Connection to a start system and shall provide the following:

1) Inputs for start system and speaker.

2) Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts) and anomalies with the speaker input or start system.

3) Detection of presence or absence of speaker input or start system.

c. Connection to a scoreboard and shall provide the following:

1) Detection of presence or absence of connected scoreboard.

2) Self-test capabilities to detect compromised timing bus wire terminations.

d. Connection to a bulkhead and shall provide the following:

1) Detection of presence or absence of connected bulkhead.

2) Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts).

3. Junction Boxes (Provided by Electrical Contractor):

a. Wall plate timing system components shall fit into a 12” x 12” x 6” PVC junction box.

b. Acceptable Manufacturer: Cantex (P/N 5133713) or similar box that will fit wall plate assembly of the following dimensions: 12” x 12” x 6” +-0.05”, cover plate width shall be 15” +-0.02” square

c. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

d. Verify routing of conduit with timing system manufacturer prior to install.

C. Deck Plates

1. Deck plates shall be provided as required in the quantities as shown on the drawings. Deck plates to permit plug-in connection for touch pads, A, B, C, backup buttons, electronic relay judging, start light signal, start speakers and a signal to start the timing device at each lane.

a. Basis of Design: Deck plates are based upon TITANIUM SERIAL DECK PLATE as manufactured by Colorado Timing System, Inc.

2. Domed deck plate node with contacts mounted on integrated slopes that cause corrosive pool water which creates water bridges to flow off through gravity, overcoming water surface tension and therefore reducing electrolytic currents and corrosion. No maintenance for corrosion shall be needed.

3. Titanium contacts as exposed connectors.

4. Inputs for button A, B, C, touchpad, start system, speaker, RJP and Speedlight (RJP as separate input, not piggy backed on another input).

5. Speedlight shall be controlled in synchronicity and individually per lane (requires RJPs).

6. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts) and anomalies with the timing components push buttons, touchpad, RJP, Speedlight, speaker or start system.

7. Ability to detect presence or absence of push buttons, touchpad, RJP, Speedlight, speaker or start system.

8. Plate shall have self-test capabilities to detect compromised timing bus wire terminations.

9. Junction Boxes (Provided by Electrical Contractor):

a. In deck system components shall fit into a 4” x 4” x 6” PVC junction box.

b. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

c. Verify routing of conduit with timing system manufacturer prior to install.

D. Start System Deck Plate

1. Start system deck plates shall be provided as required in the quantities as shown on the drawings.

    a. Basis of Design: Start system deck plates are based upon TITANIUM SERIAL START SYSTEM DECK PLATE as manufactured by Colorado Timing System, Inc.

2. Connection to start system that shall provide the following:

    a. Inputs/outputs for start system and speaker.

    b. Detection of presence or absence of speaker input or start system.

    c. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts) and anomalies with the speaker or start system.

3. Junction Boxes (Provided by Electrical Contractor):

    a. In deck system components shall fit into a 4” x 4” x 6” PVC junction box.

    b. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

    c. Verify routing of conduit with timing system manufacturer prior to install.

E. Timer Deck Plate

1. Timer deck plates shall be provided as required in the quantities as shown on the drawings.

    a. Basis of Design: Timer deck plates are based upon TITANIUM SERIAL TIMER DECK PLATE as manufactured by Colorado Timing System, Inc.

2. Connection to timer which shall allow for a pool setup without a wall plate, and shall provide the following:

    a. Connectivity to all timing courses and one scoreboard bus with one cable connection

    b. Detection of presence or absence of connected timer

    c. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts)

    d. In deck system components shall fit into a 4” x 4” x 6” PVC junction box

3. Junction Boxes (Provided by Electrical Contractor):

    a. In deck system components shall fit into a 4” x 4” x 6” PVC junction box.

    b. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

    c. Verify routing of conduit with timing system manufacturer prior to install.

F. Bulkhead Deck Plate

1. Bulkhead deck plates shall be provided as required in the quantities as shown on the drawings.

a. Basis of Design: Bulkhead deck plates are based upon TITANIUM SERIAL BULKHEAD DECK PLATE as manufactured by Colorado Timing System, Inc.

2. Connection to bulkhead that shall provide the following:

a. Detection of presence or absence of connected bulkhead.

b. Self-test capabilities to detect compromised timing bus wire terminations.

c. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts).

3. Junction Boxes (Provided by Electrical Contractor):

a. In deck system components shall fit into a 4" x 4" x 6" PVC junction box.

b. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

c. Verify routing of conduit with timing system manufacturer prior to install.

G. Scoreboard Deck Plate

1. Scoreboard deck plates shall be provided as required in the quantities as shown on the drawings.

a. Basis of Design: Scoreboard deck plates are based upon TITANIUM SERIAL SCOREBOARD DECK PLATE as manufactured by Colorado Timing System, Inc.

2. Connection to scoreboard that shall provide the following:

a. Detection of presence or absence of connected scoreboard cable.

b. Self-test capabilities to detect compromised scoreboard bus wire terminations.

c. Diagnostic capabilities to detect anomalies with connectors (corrosion, shorts).

3. Junction Boxes (Provided by Electrical Contractor):

a. In deck system components shall fit into a 4" x 4" x 6" PVC junction box.

b. All conduit interconnects between timing system boxes (deck plates and wall plates) shall be PVC. Refer to drawings for sizing.

c. Verify routing of conduit with timing system manufacturer prior to install.

2.4 SWIMMING TIMING START SYSTEM

A. Swimming Timing Start System (2 required) shall be provided to start the automatic swim timing system. The start system shall drive speakers mounted under the starting blocks, the relay judging platform strobe lights and deck side start indicators, with microphone.

1. Basis of Design: Swimming Timing Start System is based upon the CHAMPIONSHIP START SYSTEM as manufactured by Colorado Timing System, Inc.

B. System shall drive up to twenty 6-watt (reflex) corrosion resistant speakers located under the individual starting blocks as well as be able to drive individual speed lights on each starting block.

C. System shall have the capability to use either wired or wireless microphones and shall have a volume control on each microphone input.

D. Start system shall have a high impact resistant plastic molded enclosure.

E. System shall have external connections for additional strobe light, speaker output and start output.

F. The system shall run off of an external 12-volt power and have 2 internal gel cell batteries. The internal batteries will automatically be recharged while the starter is plugged in to the external power supply.

G. There shall be a LED warning light on the system showing when the internal batteries are starting to get low on power.

H. Starting Block Speaker:

1. Provided one speaker per championship starting block, plus one spare speaker (16 required). Speaker shall be mounted on starting platform. Speaker shall be corrosion resistant and designed to be used in an aquatic environment and rated for such use.

    a. Basis of Design: The starting block speaker is based upon the CTS MODEL SP-6/45 as supplied by Colorado Timing System, Inc.

2. The loudspeaker shall be a flex driver type horn projector of integrated construction. It shall be rated 6 watts for voice or music material with an on-axis frequency response of 320-6000 Hz (“6dB). The sound pressure level shall average 97dB(1W/1M) for 500 to 5000 Hz.

3. The horn and mounting base shall be tan in color and constructed of impact & UV resistant ABS, which will retain mechanical properties from -20q to +160qF. The driver cone diaphragm shall be moisture resistant. All materials shall resist damage from extreme weather exposure. Electrical connector shall be of 2-conductor banana type, .750 center to center.

4. Provision for mounting shall be clearance slots in the adjustable base and hole location points in the horn flange for adapting unit to be recess mounted.

2.5 DIVING

A. Diving scoring system shall utilize scoreboard to display diving scores and results without modification from swimming configuration.

1. Basis of Design: The diving scoring system is based upon GEN7 DIVING as supplied by Colorado Timing System, Inc.

B. Diving Scoring Software:

1. Diving scoring system software shall support standard and synchronized scoring.

2. Accept seven (7), judges’ input scores and compute award based upon proper formulas for seven (7), judges. Software shall be operable with either remote judges’ terminals or manual input of flash card scores.

3. System must be expandable to use up to eleven judges scoring terminals.

4. Permit display of the lead diver number, current diver number, dive number, degree of difficulty, judges’ scores and diver’s calculated award and total score.

5. Permit entry of all diving data into non-volatile memory for storage or receive data from meet management computer without additional modifications. Data shall include diver number, round number, dive number, and position. Degree of difficulty shall be automatically calculated based upon dive number per current USA DIVING/NCAA/NFHS regulations. Dive degree of difficulty can also be manually input.

6. Automatically recall the diver with round number, dive number and DD using minimal keystrokes. Systems which require live entry of dive information are unacceptable.

7. Permit storage of diver's point totals and provide ranking of the divers at the end of each round.

8. Permit editing of judges' scores if required by meet officials.

9. Provide an output for computer data handling of diving events.

10. Permit two-point deduction from the judges' scores and zero points for a failed dive. Such changes shall be clearly shown on the printout.

11. Printout shall provide preliminary data, diver ranking by rounds, and results of individual dives with judges' scores.

12. Judges' terminals shall be housed in sealed, water-resistant, shockproof housing.

13. The terminals shall provide a signal to inform the judge that the diving console has requested a score. Signal shall cease when an appropriate score is transmitted. They shall also allow each judge to input a score with a minimum of keystrokes, review that score via a built-in LCD display, and correct a score if needed before transmitting to the Judging Software.

14. The Software shall provide a switchable mode for sending data to the scoreboard display.

    a. Mode- Automatic- In this mode the software must send the judges scoring information to the display with no software operator interaction.

    b. Mode- Hold for Authorization – In this mode the software must receive authorization from a referee terminal or an assistant referee terminal prior to sending the scoring data to the display.

C. Remote Judging Terminal:

1. Interface hub shall plug into the PC via USB 2.0 or greater

2. Judges terminals shall include a quick release mating connector for connection to the Diving Cable Breakout Box.

3. Judges' terminals shall include rugged communications cable to connect to the diving interface box. Cable should be removable for easy cost-effective replacement of the cable.

4. Judges' terminals shall utilize sealed keyboards with a 128x64 Pixel Backlit LCD display suitable for indoor and sunlight readability.

5. Judges terminal LCD must be capable of displaying Divers Name.

6. Judges terminal LCD must be capable of displaying Divers Team or Country Name.

7. Judges terminal LCD must be capable of displaying scores of other judges once the scores have been accepted.

8. Judges terminal LCD must be capable of displaying Dive and Dive Degree of Difficulty

9. Judges terminal LCD must be capable of displaying the terminal number, so they can be easily identified to the judge

10. Judges terminals shall include a request change button to notify the software that the judge's input is requesting permission to correct the submitted score.

11. Judges terminals must be able to be assigned as a Referee's terminal or Assistant Referee's terminal allowing the device to control when the judging data is transmitted to the scoreboard display.

12. Provide seven (7), Judging Terminals (JT-01) with associated cables. Provide one interface hub box (IH-01) with associated cables. Provide two (2) cable breakout box (CB-01) with associated cables.

2.6 WATER POLO

A. Water Polo Scoring

1. Provide water polo program with the Multi-Sport Computer/Timing System. Water polo basic system shall include: water polo software, user interface with toggle for start/stop, scoreboard horn, signage for scoreboard, and manual.

   a. Basis of Design: The water polo program is based upon Colorado Timing System, Inc.

2. Accessory software program shall turn multi-sport computer and multi-sport scoreboard into complete water polo scoring system.

3. Features shall include presentable period times, timeout times, eject times for up to three players, game times, and shot time.

4. Selectable options shall include display of game time in seconds, tenths, and/or hundredths, keeps player fouls "on the fly" and records in memory.

5. Water polo scoreboard display functions shall include game time, shot time, penalty times, three (3) team scores, period number, player fouls and time of day.

6. Interface unit shall permit hand-held switch control of shot clock reset function and toggle switch for the start/stop of game time.

7. Miscellaneous features shall include: 12 or 24-hour time of day display, tenths of hundredths of a second remaining display, total game time display, individual player foul totals display.

8. Game time shall display to .01 seconds when stopped.

9. Multi-Sport Computer/Timing System shall be capable of operating two shot clocks in addition to water polo scoring.

B. Water Polo Table Top Controller

1. Provide water polo table top controller (1 required) for water polo scoring. Controller shall have:

   a. Buttons with tactile dome feedback

   b. Large transflective LCD screen that is easily readable in all environments from darkness to bright sunlight

c. Built-In real time clock to keep time of day

d. Configurable defaults allow customizing to your league rules

e. Slide-in keyboard insert

f. Able to operate multiple scoreboards with one controller

g. Supports the external Run/Stop/Reset switch to allow for additional clock operators

h. Include (1 RSR) Stop/Start/Reset switch

C. Portable Deck Clock (Shot Clock/Pace Clock)

1. Two (2) portable shot clock/pace clock shall be provided for water polo course. Shot clocks shall NOT be provided for water polo practice courses.

   a. Basis of Design: The portable deck clock (shot clock) is based upon the DC-1500 as manufactured by Colorado Timing System, Inc.

2. The clock shall include a ruggedized polyethylene enclosure that is water and sun resistant and completely corrosion free. The enclosure shall include a built-in handle to allow for easy carrying from point to point.

3. The deck clock shall be capable of being used as a game/shot clock for many sports or set to pace in time of day.

4. The deck close shall include LED digits with variable intensity settings to allow for visibility in a variety of environments and times of day or night. Time of day or game time shall be displayed at the top of the clock, with 5” digits displaying hours and minutes. 10” digits shall show seconds for pacing or shot time.

5. The deck clock shall in an integrated 2.4GHz wireless adaptor to receive game/shot data from tabletop or handheld controllers. Data can also be received from a Multi-Sport Computer/Timing System with a wireless adapter.

6. The deck clock shall be capable of providing pace in time of day (hours, minutes and seconds) without any controller. Multiple clocks shall automatically synchronize in pace mode.

7. The clock shall include an integrated horn. The horn shall produce both game and shot tones.

D. Wireless Water Polo Scoreboard

1. Provide an integrated Wireless Mini Scoreboard for water polo scoring. Scoreboard to display period/shot, game time, and home/ guest scores with 5” LED digits. Scoreboard shall include a wheeled scoreboard caddy.

   a. Basis of Design: The wireless water polo scoreboard is based upon the MS-0055 as manufactured by Colorado Timing System, Inc.

2. Power: Scoreboard shall have 115-230 V, 2 A 50/60 Hz power.

3. Scoreboard shall include a rugged powder-coated aluminum enclosure. All digits and circuit boards are conformal coated to protect against corrosion. The high gain flush mount patch antenna shall be mounted internally and shall be protected by a Lexan cover to prevent breakage by errant balls and/or weather.

4. The scoreboard shall include an integrated 2.4GHz wireless adapter to receive game/shot data from tabletop or handheld controllers. Data can also be received from a Multi-Sport Computer/Timing System with a wireless adapter.

5. Provide scoreboard caddy for water polo scoreboard.

2.7 SWIMMING TIMING COMPONENTS

A. Gutter Hung Touchpads

1. Provide 18 touchpads (18 required for the Main Course) and 12 touchpads (12 required for the Cross Course) to time swimming, in compliance with the appropriate sanctioning body.

   a. Basis of Design: The gutter hung touchpad is based upon the AQUAGRIP GUTTER HUNG TOUCHPAD as manufactured by Colorado Timing System, Inc.

2. Touchpad shall be constructed of an all-plastic exterior with only electrical connector metal exposed. Touchpad shall be the following dimensions:

   a. Touch pad shall be the TP-78G AQUAGRIP, 78” wide x 22” tall x 0.3” thick. (CROSS COURSE)

   b. Touch pad shall be the TP-90G AQUAGRIP, 90” wide x 22” tall x 0.3” thick. (MAIN COURSE)

3. Touchpad shall have a uniform fine grit and non-abrasive surface that prevents swimmer slippage in any direction.

4. Touchpad markings shall have contrasting colors with a 2” black border and black end-wall cross pattern for portion covered by touchpads.

5. Touchpad brackets shall be custom made to fit the pool. Contractor to provide sufficient number of brackets for support of each touchpad.

   a. Contractor to provide an additional 2 spare touchpad brackets.

6. Touchpad shall have a two-year warranty without a requirement to purchase a protective touchpad cart.

7. Touchpad caddy for storing the number of touch pads supplied shall be (1) CAD-TP/P and (2) CAD-TP96.

B. Relay Judging Platforms

1. Provide one (1) relay judging platform to time swim start reaction in compliance with the appropriate sanctioning body. Platform shall electronically indicate when a swimmer has left the starting block in relation to the incoming swimmer’s touch of the timing pad. Accuracy shall be 1/100th of a second

   a. Basis of Design: The relay judging platform as manufactured by Colorado Timing System, Inc.

2. Relay Judging Platform shall have a non-skid surface to prevent swimmer slippage.

3. Top and front surface shall be sensitive to the swimmer’s push off.

4. Each platform shall be capable of securing to starting blocks.

5. Refer to starting block specification for starting block top size. Relay Judging Platform shall be sized to adequately cover starting block.

6. LED Speed Light

    a. Platforms shall come equipped with speed light, LED lights that flash with the start signal.

C. Push Buttons

1. Provide two (2) back-up buttons for each touchpad provided.

2. Back-up buttons to be plunger style button with a 5’ cable.

D. Swimming Timing Systems Caddies

1. Provide touchpad caddy for storing all touch pads. The correct number of touchpad caddies shall be supplied to store all touchpads. Caddy shall be sized to match timing system touch pad widths. Touchpad caddy shall consist of an aluminum frame with four freewheeling casters. The CONTRACTOR is responsible for assembly. Touchpad caddy shall be CAD-TP/P and CAD/TP96 as manufactured by Colorado Timing Systems, Inc.

2.8 PACE/SHOT CLOCKS

A. Multi-Sport Computer/Timing System Pace Clock Program

1. Accessory software program shall turn multi-sport computer and multi-sport scoreboard into an effective training system and coaching tool.

    a. Basis of Design: GEN7 PACE CLOCK PROGRAM as manufactured by Colorado Timing System, Inc.

2. Accessory software program shall turn multi-sport computer and multi-sport scoreboard into an effective training system and coaching tool.

3. Interface to HYTEK's "Workout Manager" software with direct download to computer timer.

4. Programmable workouts are saved into memory for up to 80 workouts.

5. Workouts display on multi-line scoreboard by lane. E. START/STOP all lanes with one keystroke, or individually.

6. Include programmable "fudge factor" for coaches' election.

B. Slim Pace Clocks

1. Pace clocks shall be provided as required in the quantities as shown on the drawings.

    a. Basis of Design: SLIM PACE CLOCKS as manufactured by Colorado Timing System, Inc.

2. Pace clock shall include thirteen (13") high visibility LED digits, with variable intensity settings. The pace clock shall include a rugged powder-coated aluminum enclosure, conformal coated to protect against corrosion, a real time of day clock, and shall be suitable for indoor or outdoor use

3. Pace clock shall include twelve (12) operating channels to eliminate interference.

4. Pace clocks have an integrated real time of day chip (RTC). If multiple pace clocks are used in a facility, they will synchronize the time automatically.

5. Pace clock shall include a wireless frequency of 2.4 GHz and have autosensing power capabilities for 120/240 VAC.

6. Pace clock shall have four (13") digits.

    a. Overall Size (H x W x D): 19.25" x 42.25" x 2.8"

    b. Weight: 15 lbs

C. PC-PRO Deck Clock

1. Deck clock (one (1) required.

    a. Basis of Design: PC-PRO-R as manufactured by Colorado Timing System, Inc.

2. Deck clock shall have the capability of being controlled by a hand-held console for pacing functions. Additionally, it shall be capable of being controlled with the Multi-Sport Computer/Timing System.

3. Deck clock shall have an external switch to change from a pacing function to a water polo function.

4. Deck clock shall have the capability of using the Multi-Sport Computer/Timing System to run the water polo functions.

5. Deck clock shall be capable of 15 training modes (Lap Counter, Simple Pace Clock, Pace Clock with Cumulative Splits, Pace Clock with Lap Splits, Relay Exchanges, etc.)

6. Deck clock shall have the capability to be set up as either Master or Slave. Permanent shot clock/pace set as Master must re-transmit Pace Clock data to Slave Pace Clocks set to receive data on the same frequency.

7. Deck clock must be able to receive shot clock data from a Multi-Sport Computer/Timing System.

8. Deck clock shall have the capability to adjust the LED intensity using a Multi-Sport Computer/Timing System or via the control panel.

9. Pace clock shall include a wireless frequency of 60/50Hz and have autosensing power capabilities for 110/220 VAC.

10. Deck clock shall have four (4) 10" LED digits. Unit with digits less than 10" will not be accepted due to inadequate viewing distance.

    a. Overall Size (H x W x D): 13.5" x 36.25" x 4.75"

    b. Weight: 29 lbs

2.9 MATERIAL LIST - GEN7 SERIAL SYSTEM

	GEN7 Serial	
Qty		
1	**GEN7-TMR**	Gen7 Timer
1	**R-920-055**	Power Supply – UL Type A (US & Canada)
2	**R-600-302**	Laptop for user interface
Qty	***Floor plates & Hub***	
4	**TDPI-S2**	Titanium Starter Connect
3	**TDPI-BH3**	Titanium Bulkhead Connect- in deck
2	**TDPI-BH4**	Titanium Bulkhead Connect- on bulkhead order 1 per bulkhead
43	**TDPI-D**	Titanium Domed Deck Plate- intelligent
13	**R-530-085**	Tough gel – order one 2-part tube for every 4 deck nodes
Qty	***Wall plate***	
8	**R-1004-0549**	15x15 metal wall plate w/hardware- holds connect hubs (listed below)
6	**WPI-T1**	Wall plate- Titanium Timer Connect
6	**WPI-SC5**	Wall plate- Titanium Scoreboard Connect
1	**WPI-F4**	Wall plate – Fiber & Legacy Connect- YDS } both do not have to be
5	**WPI-485**	Wall plate – non-titanium 485 data for Gen7 Diving Use with R-015-674-xx cable
Qty	***Connection cables***	
2	**R-015-706-8**	8 meter starter cable (26 feet)
2	**R-015-707-8**	8 meter scoreboard cable (26 feet)
2	**R-015-711-4**	4 meter bulkhead cable (13 feet)
1	**R-015-715-8**	8 meter timer cable (26 feet)
Qty	***Cable installation***	
1	**TDPI-K1**	Kit- scoreboard bus head & tail node installation order 1 per scbd bus
1	**TDPI-K2**	Kit- timing bus head & tail node installation order 1 per timing bus
1000	**R-015-737**	Timing bus cable – 7-conductor sold in feet
1000	**R-015-726**	Scoreboard bus cable – 4-conductor (2 pair) sold in feet

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Verify that all work by others, related to this section, is installed.

B. Carefully examine all the construction documents that affect the work of this section.

C. Prior to starting work, notify the Architect and General Contractor of any defects requiring correction.

D. Protect other materials and installed work against damage while completing work in this section.

3.2 INSTALLATION

A. Furnish and install all custom cables, connecters, scoreboard mounting brackets, and fasteners.

B. Provide scaffolding and labor for mounting scoreboard and pulling cables.

C. Furnish and install equipment in accordance with the manufacturers drawings and instructions.

D. Provide scoreboard mounting, all timing system cable terminations, system checkout, and local operator training at time of installation. Training shall consist of one 4-hour session.

E. Furnish as-built drawings precisely locating all items.

F. Wiring and grounding shall be installed in strict accordance with the latest edition of the National Electric Code – Article 680.

END OF SECTION

SECTION 13852 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level III minimum.
c. Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Field quality-control reports.

G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," deliver copies to authorities having jurisdiction and include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. NOTIFIER; a Honeywell company.
2. Siemens Building Technologies, Inc.; Fire Safety Division.
3. Silent Knight; a Honeywell company.
4. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Heat detectors in elevator shaft and pit.
8. Fire-extinguishing system operation.
9. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.

8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
9. Activate stairwell and elevator-shaft pressurization systems.
10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
11. Recall elevators to primary or alternate recall floors.
12. Activate emergency lighting control.
13. Activate emergency shutoffs for gas and fuel supplies.
14. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

   a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
   b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable initiation devices that communicate device identity and status.

   a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
   b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 40 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a. Initiating Device Circuits: Style D.
b. Notification Appliance Circuits: Style Z.
c. Signaling Line Circuits: Style 2.
d. Install no more than 50 addressable devices on each signaling line circuit.

2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

a. Initiating Device Circuits: Style A.
b. Notification Appliance Circuits: Style W.
c. Signaling Line Circuits: Style 1.
d. Install no more than 50 addressable devices on each signaling line circuit.

D. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

E. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

G. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center.

1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.

a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.

b. Programmable tone and message sequence selection.
c. Standard digitally recorded messages for "Evacuation" and "All Clear."
d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

H. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

I. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

J. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

3. Detector Cable: Rated detection temperature 155 deg F (68 deg C). NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short- circuit wires at the location of elevated temperature.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:

   a. 75 cd.
   b. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

E. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix Ain NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

K. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

L. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt trip breaker.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 13852

Section 14 24 00
HYDRAULIC ELEVATORS

PART 1 – PROJECT INFORMATION

1.01 SYSTEM DESCRIPTION

A. Elevator Requirements:

1. Quantity & Elevator Number: 1 Passenger Elevator
2. ASME A17.1 Code Year: 2016
3. Model: Endura
4. Dual Holeless - Twin direct acting hydraulic cylinders without well-holes.
5. Loading Class: Passenger
6. Machine Room Location: Adjacent at 1st floor
7. Car Speed: 100 FPM
8. Main Power Supply:
   Voltage: 480 Volts
   Phase: 3 phase
   Hertz: 60hz
9. Entrance Size: Front - 3’ 6” wide x 7’ 0” high
10. Entrance Type: Center Opening, Stainless Steel no. 4 brushed finish
11. Number of Stops: 2
12. Number of Openings: 2- Front
13. Minimum Clear Car Inside: 6’8” wide x 5’ 5” deep
14. Cab Height: 8’0” (standard is 8’-0”)
15. Capacity: 3500 Lbs.
16. Clear hoistway size: 8’4” wide x 6’ 11” deep
17. Total Travel: 10’ 5”
18. Clear Overhead: 12’ 5” minimum
19. Pit Depth: 4’0” minimum
20. Seismic Zone: 1

21. Operation: Simplex
Simplex Collective: Using a Non-Proprietary microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Vertical Express
B. MCE Freedom
C. ThyssenKrupp Elevator
D. Approved Equal

2.2 JACK & PIT EQUIPMENT

A. Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.

A steel packing gland with a guide bearing, wiper ring and packing especially designed for hydraulic elevator service shall be provided.

Multiple section jacks, if provided, shall have machined threaded couplings with O-Ring seals to prevent leakage.

B. Buffer Spring Assembly: Attached to the pit floor with removable helical coil springs with internal stop pipes.

2.3 MACHINE ROOM COMPONENTS

A. The hydraulic power unit shall be of compact design suitable for operation under the required pressure. The pump and motor shall be connected by direct coupled (submersible type). The control valve shall control flow for up and down directions hydraulically and shall include an integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. Design shall be based on 80 elevator starts per hour.

The power unit shall be provided with a muffler to reduce pulsation and noise, which may be present in the flow of the hydraulic fluid.

The power unit shall be mounted on vibration sound dampeners designed to isolate the unit from the building structure. The power unit shall also contain a low-pressure switch (as required) and a tank shut-off valve (with non-submersible power units).

B. A Non-Proprietary microprocessor-based controller with non-serial link hall stations (do to moisture) shall be provided along with a solid state starter–NO EXCEPTIONS. Include necessary

starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as described herein. A three (3) phase overload device shall be provided to protect the motor against overloading.

C. A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

D. Oil Line & Fittings - Schedule 80 pipe shall be installed between the pumping unit and the cylinder. The oil line shall be supported with an adequate number of pipe supports. Oil of a proper grade for this service shall be provided.

E. A ball valve shall be provided in the machine room and in the elevator pit for maintenance and adjusting purposes.

2.4 HOISTWAY COMPONENTS

A. Platform: The car platform shall be constructed of structural steel members welded or fastened securely together. The underside of the platform shall be properly fireproofed. A toe guard shall be properly fastened to the platform per code.

a. Sub-Flooring: Plywood (2) Layers of 1/2” (standard)

b. Finished Flooring: To be selected by Owner and installed by Others.

B. Car Frame: A car frame, manufactured of structural steel members, shall be provided with adequate bracing to support the platform and car enclosure. All members are to be securely fastened together and reinforced to form a unitized section. The buffer striking plate on the underside of the car-frame platform assembly must fully compress the spring buffer mounted in the pit before the plunger reaches its lower limit of travel.

C. Guide Shoes - The top and bottom of the car frame shall be provided with suitable slide guide shoes of the self-aligning swivel type. A removable polyethylene gib shall be provided with each guide shoe.

D. Guide Rails & Brackets: Steel, omega shaped, fastened to the building structure with steel brackets.

E. Limits & Leveling Switches - Limit switch package to consist of switches and brackets that mount to the back of the rail. Switches include top and bottom slowdown, top and bottom directional and top and bottom final. The elevator will be provided with an automatic leveling device which will bring the car to a stop within 3/8" of the landing level regardless of load or direction of travel. Landing level will be maintained within the leveling zone irrespective of the hoistway doors being open or closed.

F. Wiring: Insulated wiring shall have a flame retarding and moisture resisting outer cover and shall run in a metal conduit, metallic tubing or wire ducts. All insulated conduction and conduit, or tubing, as well as fittings including metal boxes, troughs and ducts, shall comply with the requirements of the National Electric Code.

G. Pit Stop Switch - An emergency stop switch will be located in the pit.

H. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.

I. Top of Car Inspection – The elevator shall be provided with an operating device mounted above the cab which will permit slow speed operation for purposes of adjustment, inspection, maintenance, and repair.

J. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.

K. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.

L. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.

M. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.

N. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.

O. General Contractor shall fill and grout around entrances, as required.

P. All walls and sill supports must be plumb where openings occur.

Q. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.

R. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.

S. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc.

2.5 HOISTWAY ENTRANCES

A. Passenger Entrances - Each entrance shall include unit frames, flush design door panels, sight guards, sills, strut angles, headers, hanger covers, fascia plates, toe guards, dust covers and necessary hardware.

1. Frames: 14 gauge entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall have a UL 1-1/2 hour fire protection rating.

Frame Finish: Stainless Steel no. 4 brushed finish

2. Sills: Aluminum

3. Sight Guards: Stainless Steel no. 4 brushed finish sight guards will be furnished.

4. Doors: Single Center Opening, 14 gauge entrance doors. All doors shall have a UL 1-1/2 hour fire protection rating.

   Door Finish: Stainless Steel no. 4 brushed finish

5. Fascia, hanger covers, toe guards, dust covers, and structural members will be fabricated and finished in accordance with standard finishes and materials.

2.6 CAB ENCLOSURE

A. Walls: Steel Shell: Stainless Steel no. 4 brushed finish.
B. Canopy: Cold-rolled steel with hinged exit.
C. Ceiling: Downlight type, metal pans with suspended LED downlights.
D. Cab Fronts, Return Transom, Soffit and Strike: Provided panels faced with Stainless Steel no. 4 brushed finish.
E. Doors: Horizontal center opening car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless Steel no. 4 brushed finish
   b. Cab Sills: Extruded Aluminium, mill finish.
F. Handrail: Provide 1.5” diameter cylindrical metal on side walls. Handrails shall have a Stainless Steel no. 4 brushed finish.
G. Ventilation: Manufacturer’s standard exhaust fan, mounted on car top.
H. Protection Pads: Protection Pads and Buttons (all walls)

2.7 DOOR EQUIPMENT

A. Passenger Door Equipment

1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call. Door operation will be automatic at each landing with door opening being initiated as the car arrives at the landing and closing taking place after expiration of a time interval. A car door electric contact will prevent starting the elevator away from the landing unless the car door is in the closed position. Doors will be arranged to remain open for a time period sufficient to meet disability requirements.

2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening.

2.8 SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A fixed car operating panel shall be provided which all push buttons, key switches, and message indicators for elevator operation. All buttons to be located per ADA.

Fixture Finish: Stainless Steel no. 4 brushed finish

1. The car operating panel shall be equipped with the following features including those as required by ASME A.17. 2007 Code
    a. Illuminated LED push buttons
    b. Raised markings and Braille
    c. Digital car position indicator
    d. Door open and door close buttons
    e. Light key-switch
    f. Fan key-switch
    g. Access key-switch
    h. Independent service key-switch
    i. Illuminated alarm button with raised markings
    j. In car stop switch (toggle or key unless local code prohibits use)
    k. Firefighter's jewel
    l. Firefighter's phase II key-switch
    m. Emergency light
    n. Call cancel button
    o. ADA handsfree phone located behind a perforated speaker pattern
    p. Push to call button – Shall initiate the handsfree phone between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
    q. Firefighter's phase II locked cabinet and emergency in-car operating instructions, worded according to code.

B. Car Lantern(s) – One lantern per car opening shall be supplied with one gong stroke up and two gong strokes down. As soon as the car has reached a predetermined distance from a landing and is set to stop at that landing, the corresponding lantern shall be illuminated and the gong shall sound and the lantern shall remain illuminated until the car has left that landing.

C. Hall Stations: Hall stations shall be provided with necessary push buttons and key switches for elevator operation. When a button is pressed, it shall illuminate, signaling to the waiting passenger that the call has been registered. Each button shall remain illuminated until the call has been answered. All buttons to be located per ADA. Hall station buttons are to be non-serial.

The designated fire return floor shall include a fireman's emergency key switch that meets state and local requirements.

Hoistway access shall be provided as per applicable code.

D. Handicap Markings - Braille plates shall be furnished for car buttons, car controls, and hoistway entrance jambs in compliance with NEII and ADA handicap requirements.

E. Hall Position Indicator centered above the entrance frame at 1st floor only.

F. Utility Outlet: A 110VAC utility outlet shall be furnished in the cab enclosure.

PART 3 - EXECUTION

3.1 PREPERATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 SUBMITTALS

A. Shop Drawings: Submit approval layout drawings. Include the following:

1. Car, guide rails, buffers and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.
7. Cab enclosure drawings
8. Signal fixture drawings

B. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual after the project is released into production.

3.3 QUALITY ASSURANCE

A. Manufacturer: Provide the car frame, platform, power unit, and jack from by a firm with a minimum of 20 years experience in fabrication of elevators equivalent to those specified.

B. Regulatory Requirements: Elevator system design and installation shall comply with the applicable versions of ASME A17.1 2016 Code based on the project city and state.

1. When required, the elevator shall be designed in response to Americans with Disabilities Act Accessibility Guidelines (ADAAG).

3.4 DELIVERY, STORAGE AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

3.5 WARRANTY

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The guarantee period shall not extend longer than one (1) year from the date of shipment or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The guarantee excludes ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

3.6 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.

1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1 manufacturer's installation instructions and approved shop drawings.
2. Comply with the National Electrical Code for electrical work required during installation.

B. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

C. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

3.7 TRADES BY OTHERS

A. Related Sections: The following sections contain requirements that relate to this section and are performed by other trades.

1. Construction Facilities and Temporary Controls: protection of floor openings and personnel barriers; temporary power and lighting.
2. Earthwork: excavation for cylinder well casing.
3. Cast-In-Place Concrete: elevator pit, elevator motor and pump foundation, and grouting thresholds.
4. Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway door frames, grouting thresholds.
5. Metal Fabrications: pit ladder, divider beams, support for entrances and rails, hoisting beam at top of hoistway.
6. Waterproofing: waterproofing of elevator pit.
7. Heating, Ventilating, and Air Conditioning: ventilation and temperature control of elevator equipment room. Machine room temperature must be maintained between 55° and 90°F.
8. Electrical: electrical service to main disconnect in elevator machine room; electrical power for elevator installation and testing; electrical-disconnecting device to elevator equipment prior to activation of sprinkler system; electrical service for machine room; machine room and pit receptacles with ground-fault current protection; lighting in machine room and pit; wiring for telephone service to machine room.
9. Standby Power Supply Systems: emergency generator for elevator operation.
10. Fire Alarm Systems: fire and smoke detectors and interconnecting devices; fire alarm signal lines to contacts in the machine room.
11. Telephone Systems: ADAAG-required emergency communications equipment.

12. Pit Sump Pump: Shall be installed below pit floor with a metal grate installed over pump hole. Pump must flow 3,000 gallons per hour.
13. Permits and Inspections: Provide licenses and permits and perform required inspections and tests.

3.8 MAINTENANCE SERVICE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours, excluding callbacks. Service shall consist of no less than a quarterly examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.

1. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

END OF DOCUMENT

SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification Section apply to this and other sections of Division 15.

B. Before submitting his proposal, each bidder shall examine all plans and specifications relating to the work, visit the site(s) of the proposed project, and become fully informed of the extent and character of the work required.

1.2 REFERENCE STANDARDS

A. Perform all Division 15 work in strict accordance with the Laws and Regulations of the State of Texas, and County and City codes/ordinances having jurisdiction over the project.

1.3 COORDINATION

A. Coordinate work under this Division to avoid conflicts and to attain satisfactory and complementary systems.

B. Coordinate work under this Division with work under other Divisions to avoid conflicts and to allow for adequate installation, maintenance, and operating space. Obtain the Architect's approval for penetrations of other parts of the Work prior to affecting them.

C. Prepare coordination drawings in accordance with Division 1 to a scale of ¼"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow if the work.

1.4 DEFINITIONS

Specific meanings used in Division 15 (variant forms are inferred):

A. Work: This project, or the reference part.

B. Provide:

1. Furnish and install, complete with necessary appurtenances.
2. "Provide" is implied throughout this Division unless language is specific.

C. Required: Required by the contract Documents.

D. Necessary: Necessary in order to obtain a finished system in satisfactory operating condition, and meeting all requirements.

E. Furnish: Procure and deliver, ready for installation, necessary and/or required.

F. Install: Receive, place securely, ready for connection to work specified elsewhere, and bring into satisfactory operating condition, as necessary and/or required.

G. Connect: Connect properly to mechanical work. This includes non-physical "connections" such as indirect waste drains.

H. Architect, Project Architect or Architect/Engineer Team.

1.5 SCOPE OF WORK

A. The work under this Division includes providing complete mechanical systems for the project.

B. All items of labor, material or equipment not required in detail by the specifications or plans, but incidental to, or necessary for the complete installation and proper operation of all phases of work described herein, or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Contract Documents.

1.6 WORKMANSHIP

A. All labor shall be performed in a workmanlike manner by mechanics skilled in their particular trades. All installations shall be complete in both effectiveness and appearance whether finally enclosed or left exposed. The architect reserves the right to direct the removal or replacement of any item which in his opinion shall not present a reasonable neat or workmanlike appearance, providing that same can be properly installed in an orderly way.

1.7 MANUFACTURER'S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with the plans and specifications, manufacturer's instructions and applicable codes. Contractor shall obtain written recommendations of installation and start-up instructions from material vendors and comply, unless otherwise required. Bring discrepancies between these instructions and project requirements to the attention of the Architect, and resolve prior to construction. Provide signed inspection report by manufacturer's representative at system start-up to verify all is in compliant for product warranty.

1.8 WARRANTY

A. The contractor shall warranty his work against defective materials and workmanship for a period of 1-year from date of acceptance of the job.

1.9 TRAINING

A. Upon completion of the work and at a time designated by the Owner's representative, provide a formal training session for the Owner's operating personnel to include location, operation, and maintenance of all mechanical equipment and systems.

1.10 PERMITS AND FEES

A. Permits: Obtain special permits necessary for this portion of the Work.

B. Fees: Pay any fees associated with permits, required inspections, and permanent utility connections to this part of the work.

1.11 LICENSES

A. Work under this Division shall be performed by organizations and individuals holding a current license to perform such type of work by the authority having jurisdiction. “License” in this sense means any process, regardless of its appellation, which is normally mandated by the authority in order to perform such type of work within its jurisdiction. The stipulation of this paragraph applies even if the work is located physically on property owned or controlled by a higher authority. E.G., to work within the city limits of Corpus Christi, Texas, on a Federal project, State of Texas and City of Corpus Christi licenses which would be mandated to work on a private project shall be required even though the City and State may have no jurisdiction over the higher government.

B. In the event that the licensed organization loses its license or is unable to obtain one, or the licensed individual performing the work becomes unlicensed or deports the organization, notify Architect immediately in writing.

1.12 UTILITY COORDINATION

A. Permanent: Provide all ancillary work necessary to obtain utility connections. Pay connection fees. Arrange for connection in a timely manner. Coordinate time and arrangement of other work with the serving utility, and comply with utility standards.

B. Temporary: Refer to Division 1.

C. General: The contractor shall verify to his own satisfaction the location, elevation and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work. The contractor shall also verify location, conduct all necessary tests, inspections, coordinate with owner’s representatives and utilities, and check or existing underground utilities and lines before ditching. Repair of any cut or damaged lines or utilities shall be the sole responsibility of the contractor.

1.13 LISTING AND LABELING

Materials required to be listed shall be listed and labeled for the particular service if a listing is available. Obtain and comply with the terms of listings. Listed material include.

A. NSF: Potable water and sanitary waste systems components.

B. UL: Electrical materials.

C. AMCA: Air moving devices and related accessory items.

D. ARI: HVAC equipment.

E. FM or UL: Hazardous fluid and fire protection system components.

F. FIA, FM or AGA: Fuel gas system components.

1.14 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new. Products shall be currently manufactured.

B. All materials and equipment shall be clearly marked, stamped or labeled for identification. Do not obscure nameplates. Where manufactures nameplates do not meet the requirements of the mechanical identification specification provide nameplates in accordance with the specification.

C. All products of similar type shall be provided by a single manufacturer throughout the project.

1.15 SUBMITTALS AND REVIEW

A. Contractor shall furnish to the Architect, within a reasonable time after award of contract, and prior to commencing any work, complete brochures in quadruplicate (plus quantity required by the Contractor) of all materials and equipment which the contractor proposes to furnish on the project. Data shall include descriptive literature, performance data, diagrams, capacity information, etc., to substantiate that proposed equipment will meet all of the requirements of the plans and specifications.

B. All data must be checked and any required changes noted thereon by the contractor, signed and dated prior to furnishing same to the Architect for approval. Contractor's attention is directed that it is mandatory that he thoroughly review data prior to furnishing same to assure that equipment is in accordance with plans and specifications and to assure prompt return of the data.

C. Deviations: Specifically call to the attention of the Architect every proposed deviation from the Contract Document requirements. Failure to identify deviations as such constitutes a representation that all requirements are not met.

D. Review: Review of submittals shall not be constructed as releasing the Contractor from responsibility, but rather as a means to facilitate coordination of the work and the proper selection and installation of the products. All work shall be subject to final acceptance by the Architect at the completion of the project.

E. If above information is not provided complete as specified above and within the allocated time, all equipment shall be furnished exactly as specified without any substitutions.

1.16 SUBSTITUTIONS

A. Refer to the Conditions of the Contract.

B. Where one vendor is indicated for a product, it is to establish a level of quality and performance; provide a product equal to that product in all respects from a vendor of equivalent performance.

C. Where multiple vendors are indicated for a product, any of those vendors meeting the requirements may be submitted.

D. Some product specifications in this Division are of the Acceptable Manufacturer type. Vendors listed as Acceptable Manufacturers are acceptable as vendors. However, the product submitted is subject to review as being fully equivalent in detail to the basis of design.

E. Where multiple vendors are listed with product model numbers, each model and vendor is acceptable, provide all requirements are met. Model numbers are indicated to the extent believe necessary to identify a type and are not necessary completely.

F. The architectural/engineering team has designed the facility using requirements of the Basis of Design equipment. Any substitutions from the basis of design, which will require additional A/E design and/or coordination, shall include the cost of necessary redesign by professionals licensed in the respective disciplines and the approval of the professional of record.

1.17 DRAWINGS AND SPECIFICATIONS

A. These specifications are accompanied by Drawings. The Drawings and Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both.

B. The Drawings are generally diagrammatic. Lay out work at the site to conform to existing conditions; architectural, structural, mechanical, and electrical conditions; to avoid all obstructions; and to conform to details of installation as required. Provide an integrated satisfactorily operating installation. All necessary offsets in piping, fittings, duct, etc., required to avoid interferences between piping, equipment, architectural, and structural elements shall be provided by the Contractor. Provide all necessary routing and offsets to avoid conflict.

C. Verify and arrange that sufficient space is provided for the installation of proposed products and that adequate access will exist for service and maintenance of equipment. For this work, adequate access shall be defined as meaning that service personnel can access and maintain a piece of equipment without having to alter permanent construction. Further, for equipment located above ceilings, access shall be available within 3 feet pf ceiling opening or lay-in ceiling.

1.18 COMPLEMENTARY DOCUMENTS

A. Contract documents are complementary; requirements are not necessarily repetitively stated at each possible subject; consider that a requirement applies wherever applicable.

B. In the event of conflicting requirements in different parts of the Documents, the more expensive shall be presumed to apply, unless the Architect clarifies the requirement in a less expensive manner and waives the more expensive requirement in writing.

Since codes and standards are incorporated by reference, a particular conflict may appear in that a reference may use language that implies that a particular requirement in the Construction Documents is waived under the reference. This is not the case, unless specifically so clarified by the Architect. Generally, the specific Drawings and Specifications take precedence over waivers in multi-purpose reference documents.

C. Because of licensure and workmanship requirements, persons performing the work are presumed to be familiar with applicable codes, ordinances, laws, regulations and standards. Therefore, details of materials, methods, arrangements and size contained in such publications

are not necessarily replicated in the Contract Documents. This in no way deletes the requirement of the Contractor to comply. In the event of an apparent conflict between such publications and the Contract Documents, request clarification from the Architect prior to construction.

1.19 PROTECTION

A. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation. All materials and equipment shall be covered and protected against dirt, water, chemicals or mechanical injury.

1.20 CUTTING AND PATCHING

A. All subcontractors shall notify the General Contractor sufficiently ahead of construction of any floor, walls, ceiling, roof, etc., of any openings that will be required for his work. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner.

1.21 DEMOLITION

A. It shall be the responsibility of the contractor to see that all demolition and remodeling work involving his trade is accomplished in a manner and completeness to provide the appearance of new construction work.

B. Coordinate with other divisions before commencing work.

C. Abandoned air conditioning units shall be removed and disposed of off site in a legal manner.

D. All abandoned and/or otherwise unused piping shall be securely capped using materials of the same composition as the original piping.

1.22 RECORD DOCUMENTS

A. Drawings: The Contractor shall maintain and update daily a set of "blueline" prints in the Field Office for the sole purpose of recording "installed" conditions. Revise the drawings to reflect as-built conditions, including all addenda, change orders, final shop drawing reviews, and field routing. Underground utilities shall be dimensionally located relative to readily accessible and identifiable permanent reference points, with accurate slope and elevation indicated. Submit prints for review. Revise, certify accuracy, and provide two final sets to the Architect.

B. Owner's Manual: Prior to final acceptance, provide two bound volumes to the Architect. Index by subject. Include corrected submittals and shop drawings that reflect final review comments; installation, operation and maintenance instructions, parts lists, wiring diagrams, and piping diagrams; warranties.

1.23 INSPECTION, OBSERVATION, AND TESTING

A. Cooperate with Architect's representative and authorities having jurisdiction. Provide complete access to the work at reasonable times.

B. Cover-up: Prior to covering up work, or conducting observed tests, request observation as appropriate. Provide adequate advance notice defined as a minimum of five working days. In some cases the Architect's representative may waive observation; otherwise arrange for observed construction and testing prior to cover-up. Should minimize required notice not to be provided and the contractor covers up work requiring observation, such work shall be uncovered at contractor's expense.

C. Pre-Testing: Self-inspect, pre-test, and remedy work prior to performing observed test.

D. Sectional Work: In circumstances where a requirement for phased construction or other considerations dictate sectional construction and/or testing, notify the Architect when construction begins on the first section of a system, and when the first section will be ready for observed testing, as well as subsequent sections. Test in the largest practical sections.

1.24 WORK PERFORMED UNDER OTHER DIVISIONS

A. Refer to Division 2 for piped utilities beyond 5 feet from the building.

B. Refer to Division 16 for power wiring systems external to equipment and control panels; starters in motor centers; safety switches not integral to equipment or starters provided under Division 15.

C. Refer to Division 14 for kitchen, laboratory, medical and like equipment.

1.25 REFERENCE TO OTHER DIVISIONS

A. Refer to Division 16 for additional material requirements of electrical components provided under Division 15, such as loose starters, wiring and devices integral to equipment.

B. Refer to Division 2 for additional requirements governing excavation and backfill, supplemental to the requirements stated in this Division 15.

C. Comply with all requirements applicable to work required under this Division.

1.26 TESTING SERVICES

A. Additional Testing: In addition to any specified testing, the Architect may cause additional testing to be performed by an independent testing laboratory or any other qualified party. If such testing reveals deficient work by the Contractor, the Contractor shall pay for both the testing and remedial work. If such testing does not reveal deficient work by the Contractor, the Owner shall pay for the testing and the cost of repairing any damage caused by such testing.

B. Specified Testing Services: If independent testing services are specified regarding work under this Division, cooperate fully with the testing agency. Provide access to the work. Provide test holes and taps necessary. Remove work that is not tested on site, deliver to testing agency, and reinstall if undamaged; replace if damaged. Provide utilities, operational capability, and facilities for on-site testing as necessary.

1.27 WORK BY OWNER

A. The owner will award contracts on work which includes:

1. None.

1.28 OWNER FURNISHED PRODUCTS

A. Products furnished to the site and paid for by the Owner.

1. None.

END OF SECTION 15010

SECTION 15050 - MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Labeling and identifying mechanical systems and equipment is specified in Division 15 Section "Mechanical Identification."
9. Nonshrink grout for equipment installations.
10. Field-fabricated metal and wood equipment supports.
11. Installation requirements common to equipment specification sections.
12. Mechanical demolition.
13. Cutting and patching.
14. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data Book: Submit product data for all Division 15 items in a single reinforced 3-ring binder. Organize product data by specification section number. Provide table of contents showing the following:
1. Specification Section
2. Description of item
3. Submission number (1st submission, 2nd submission, etc.)
4. Submittal status (Approved, Revise and Resubmit, etc.)

B. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

D. Coordination Drawings: For access panel and door locations.

E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for installing and maintaining insulation.
3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
4. Equipment and accessory service connections and support details.
5. Exterior wall and foundation penetrations.
6. Fire-rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Eclipse, Inc.; Rockford-Eclipse Div.
    d. Epco Sales Inc.
    e. Hart Industries International, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Industries, Inc.; Wilkins Div.

2. Dielectric Flanges:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Epco Sales Inc.
    d. Watts Industries, Inc.; Water Products Div.

3. Dielectric-Flange Insulating Kits:

    a. Calpico, Inc.
    b. Central Plastics Co.

4. Dielectric Couplings:

    a. Calpico, Inc.
    b. Lochinvar Corp.

5. Dielectric Nipples:

    a. Grinnell Corp.; Grinnell Supply Sales Co.
    b. Perfection Corp.
    c. Victaulic Co. of America.

6. Metal, Flexible Connectors:

    a. ANAMET Industrial, Inc.
    b. Central Sprink, Inc.
    c. Flexicraft Industries.
    d. Flex-Weld, Inc.
    e. Grinnell Corp.; Grinnell Supply Sales Co.
    f. Hyspan Precision Products, Inc.
    g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
    h. Mercer Rubber Co.
    i. Metraflex Co.
    j. Proco Products, Inc.
    k. Uniflex, Inc.

7. Rubber, Flexible Connectors:

    a. General Rubber Corp.
    b. Mercer Rubber Co.
    c. Metraflex Co.
    d. Proco Products, Inc.
    e. Red Valve Co., Inc.
    f. Uniflex, Inc.

8. Mechanical Sleeve Seals:

    a. Calpico, Inc.
    b. Metraflex Co.
    c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

1. 2-Inch NPS and Smaller: Threaded.
2. 2-1/2-Inch NPS and Larger: Flanged.
3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.

B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

5. PVC: Manufactured, permanent, with nailing flange for attaching to wooden forms.
6. PVC Pipe: ASTM D 1785, Schedule 40.
7. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: One piece, with set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Cast Brass: Split casting, with concealed hinge and set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

5. Stamped Steel: One piece, with set screw and chrome-plated finish.
6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
11. Cast-Iron Floor Plate: One-piece casting.

2.8 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: Accessible and visible location.

C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inch- high letters for ductwork and not less than 3/4-inch- high letters for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Material: Brass.
3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

F. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:

1. Green: Cold air.
2. Yellow: Hot air.
3. Yellow/Green or Green: Supply air.
4. Blue: Exhaust, outside, return, and mixed air.
5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
6. Nomenclature: Include the following:

    a. Direction of airflow.
    b. Duct service.
    c. Duct origin.
    d. Duct destination.
    e. Design cubic feet per meter.

G. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.

1. Fabricate in sizes required for message.
2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, unless otherwise indicated.
5. Thickness: 1/8 inch, unless otherwise indicated.
6. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

H. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Yellow/Green: Combination cooling and heating equipment and components.
4. Brown: Energy reclamation equipment and components.
5. Blue: Equipment and components that do not meet any criteria above.
6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.

I. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.9 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Permanent sleeves are not required for holes formed by PE removable sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

Q. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. PVC Pipe Sleeves: For pipes smaller than 6-inch NPS.
    b. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    c. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    d. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

        1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Section "Joint Sealants" for materials.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

R. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Section "Firestopping" for materials.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
5. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
6. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
7. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

8. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
9. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
10. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. ABS Piping: ASTM D 2235 and ASTM D 2661.
    c. CPVC Piping: ASTM D 2846 and ASTM F 493.
    d. PVC Pressure Piping: ASTM D 2672.
    e. PVC Nonpressure Piping: ASTM D 2855.
    f. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

11. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

X. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
3. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
    c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
    d. At access doors, manholes, and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
    g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.

1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.

D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.4 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates

for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

A. Disconnect, demolish, and remove Work specified in Division 15 Sections.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from Project site.

F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 15050

SECTION 15067 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 13 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.
3. Division 15 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
4. Division 15 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
5. Division 15 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1**, "**Structural Welding Code—Steel**"**

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers: Similar to MSS Type 1, steel pipe hanger except hanger is made of fiberglass and continuous-thread rod and nuts are made of polyurethane or stainless steel.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Champion Fiberglass, Inc.
c. Cope, T. J., Inc.; Tyco International, Ltd.
d. Seasafe, Inc.
e. Unistrut Corp.; Tyco International, Ltd.
f. Wesanco, Inc.

B. Strap-Type, Fiberglass Pipe Hangers: Made of fiberglass loop with stainless-steel continuous-thread rod, nuts, and support hook.

1. Available Manufacturers:

a. Plasti-Fab, Inc.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.6 FIBERGLASS STRUT SYSTEMS

A. Description: Shop- or field-fabricated pipe-support assembly, similar to MFMA-3, made of fiberglass channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Champion Fiberglass, Inc.
3. Cope, T. J., Inc.; Tyco International Ltd.
4. Seasafe, Inc.

2.7 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.

5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.9 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Available Manufacturers:

a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Portable Pipe Hangers.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturers:

a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.10 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.11 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 7 Section "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **NPS 2-1/2 (DN 65)**] and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

P. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15062

SECTION 15077 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Stencils.
5. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches (32 mm) for ducts; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch (25 mm) high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

END OF SECTION 15077

SECTION 15080 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes mechanical insulation for duct, equipment, and pipe, including the following:

1. Insulation Materials:

    a. Phenolic Foam.
    b. Cellular glass.
    c. Flexible elastomeric.
    d. Mineral fiber.

2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Lagging adhesives.
7. Sealants.
8. Factory-applied jackets.
9. Field-applied fabric-reinforcing mesh.
10. Field-applied cloths.
11. Field-applied jackets.
12. Tapes.
13. Securements.
14. Corner angles.

B. Related Sections include the following:

1. Division 2 Section "Hydronic Distribution" for loose-fill pipe insulation in underground piping outside the building.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties, equipment connections, and access panels.
5. Application of field-applied jackets.
6. Application at linkages of control devices.
7. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. ACS.
    b. Pittsburgh Corning Corporation; Foamglas Super K.
2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
3. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Available Products:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Owens Corning; All-Service Duct Wrap.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. CertainTeed Corp.; Commercial Board.
    b. Johns Manville; 800 Series Spin-Glas.
    c. Knauf Insulation; Insulation Board.

d. Owens Corning; Fiberglas 700 Series.

J. Mineral-Fiber, Preformed Pipe Insulation:

1. Available Products:
   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000(Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

2.3 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 1 or 2-hour fire rating, as required.

1. Products:

   a. CertainTeed Corp.; FlameChek.
   b. Johns Manville; Firetemp Wrap.
   c. Thermal Ceramics; FireMaster Duct Wrap.
   d. 3M; Fire Barrier Wrap Products.

2.4 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.5 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

2.6 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

2.7 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
2. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
3. Color: White.

2.8 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Products:

a. Childers Products, Division of ITW; CP-76.
b. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: White.

2.9 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.10 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. inch (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. (203 g/sq. m) with a thread count of 5 strands by 5 strands/sq. inch (2 strands by 2 strands/sq. mm) for covering equipment.

2.11 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

2.12 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness 20 mil; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

4. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Thickness: 0.020” Smooth.
c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.13 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.14 SECUREMENTS

A. Bands:
1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

2.15 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves

and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

3.5 DUCT AND PLENUM INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install capacitor-discharge-weld pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

3.6 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not overcompress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from galvanized steel, at least 0.040 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.7 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe

insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.8 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.9 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.10 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install capacitor-discharge-weld pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic

applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install capacitor-discharge-weld pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and

inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.11 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.12 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous UL-listed fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.13 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections. Paint only those items in exposed, public areas.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent inspecting agency to perform field inspections and prepare inspection reports.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements. Remove defective Work.

C. Install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures after new materials are installed.

3.15 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed oven and warewash exhaust.
6. Indoor, exposed oven and warewash exhaust.
7. Indoor, concealed exhaust air.
8. Indoor, exposed exhaust air.
9. Outdoor, concealed supply and return.
10. Outdoor, exposed supply and return.

B. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.

4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.16 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

E. Concealed, rectangular, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

F. Concealed, rectangular, return-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

H. Concealed, rectangular, exhaust-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

I. Concealed, return-air plenum insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
   2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

J. Exposed, round and flat-oval, supply-air duct insulation shall be the following:

   1. Double wall insulated duct.

K. Exposed, round and flat-oval, return-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
   2. Insulation not required in conditioned spaces.

L. Exposed, round and flat-oval, outdoor-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

M. Exposed, round and flat-oval, exhaust-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and nominal density.
   2. Insulation not required in conditioned spaces.

N. Exposed, rectangular, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

2. For rectangular ducts in public spaces, use double-wall insulated duct.

O. Exposed, rectangular, return-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches thick and nominal density.
2. Insulation not required in conditioned spaces.

P. Exposed, rectangular, outdoor-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

Q. Exposed, rectangular, exhaust-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Insulation not required in conditioned spaces.

R. Exposed, return-air plenum insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

3.17 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Round, flat-oval, and rectangular supply-air duct insulation shall be the following:
1. Flexible Elastomeric: 3 layers, each 1” thick.

C. Round,flat-oval, and rectangular return-air duct insulation shall be the following:
1. Flexible Elastomeric: 3 layers, each 1” thick.

3.18 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Chillers: Insulate cold surfaces on chillers, including, but not limited to, evaporator bundles, suction piping, compressor inlets, tube sheets, water boxes, and nozzles with the following:
1. Flexible Elastomeric: 1 inch thick.

D. Heat-exchanger (water-to-water for cooling service) insulation shall be the following:
1. Flexible Elastomeric: 1 inch thick.

E. Chilled-water pump insulation shall be the following:

1. Cellular Glass: 3 inches thick.

2. Phenolic Foam: 2 inches thick.

F. Condenser-water pump insulation shall be the following:
1. Not applicable.

G. Domestic water pump insulation shall be the following:
   1. Not applicable.

H. Heating-hot-water pump insulation shall be the following:
   1. Cellular Glass: 3 inches thick.

I. Chilled-water expansion/compression tank insulation shall be the following:
   1. Flexible Elastomeric: 1 inch thick.

J. Chilled-water air-separator insulation shall be the following:
   1. Flexible Elastomeric: 1 inch thick.

K. Domestic hot-water storage tank insulation shall be the following:

   1. Mineral-Fiber Board: 4 inches thick and 2-lb/cu. ft. nominal density.

L. Thermal storage tank (brine, water, ice) insulation shall be the following:

   1. Cellular Glass: 4 inches thick.

3.19 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

   1. Fire-suppression piping.
   2. Drainage piping located in crawl spaces.
   3. Below-grade piping.
   4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.20 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

   1. Insulation shall be the following:
      a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

   1. Insulation shall be the following:
      a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

C. Domestic Chilled Water (Potable):

   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

D. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. Insulation required only on horizontal runs.

E. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

F. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 3/4 inch thick.

G. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

H. Chilled Water and Brine, above 40 Deg F:

1. NPS 4 DN 100 and Smaller: Insulation shall be the following:

   a. Cellular Glass: 1-1/2 inches thick.

   b. Phenolic Foam: 1 inch thick.

2. NPS 6 (DN 150) to NPS 12 (DN300: Insulation shall be the following:

   a. Cellular Glass: 2 inches thick.

   b. Phenolic Foam: 1 ½ inches thick.

3. NPS 14 (DN350) and Larger: Insulation shall be the following:

   a. Cellular Glass: 2 - ½ inches thick.

   b. Phenolic Foam: 2 inches thick.

I. Condenser-Water Supply and Return:

1. No insulation.

J. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

K. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 3/4 inch thick.

3.21 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inches thick.

C. Chilled Water and Brine:

1. All Pipe Sizes: Insulation shall be the following:

   a. Cellular Glass: Refer to interior schedule for thickness.

   b. Phenolic Foam: Refer to interior schedule for thickness.

D. Condenser-Water Supply and Return:

1. All Pipe Sizes: Insulation not required.

E. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 ½ inches thick.

F. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.

3.22 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Division 2 piping distribution Sections.

B. Chilled Water, All Sizes: Use pre-insulated pipe system.

C. Condenser-Water Supply and Return, All Sizes: Insulation not required. Provide anti corrosion coating as specified in Hydronic Piping Specification.

D. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F and below: Use pre-insulated pipe system.

3.23 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.

E. Equipment, Concealed:

1. None.

F. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. None.

G. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. None.

H. Piping, Concealed:
1. ASJ – factory.

I. Piping, Exposed:
1. PVC: 20 mils thick.

3.24 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:
1. Painted Aluminum, Smooth: 0.020 inch thick.

D. Ducts and Plenums, Exposed:
1. Painted Aluminum, Smooth: 0.020 inch thick.

E. Equipment, Concealed:
1. PVC: 20 mils thick.

F. Equipment, Exposed:

1. Aluminum, Smooth: 0.020 inch thick.

G. Piping, Concealed:
1. PVC: 20 mils thick.

H. Piping, Exposed:
1. Aluminum, Smooth: 0.020 inch thick.

3.25 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 15080

SECTION 15110 - VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following general-duty valves:

1. Bronze angle valves.
2. Cast-iron angle valves.
3. Copper-alloy ball valves.
4. Ferrous-alloy ball valves.
5. Ferrous-alloy butterfly valves.
6. Bronze check valves.
7. Gray-iron swing check valves.
8. Ferrous-alloy wafer check valves.
9. Spring-loaded, lift-disc check valves.
10. Bronze gate valves.
11. Cast-iron gate valves.
12. Bronze globe valves.
13. Cast-iron globe valves.
14. Chainwheel actuators.

B. Related Sections include the following:

1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
2. Division 15 Section "Mechanical Identification" for valve tags and charts.
3. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. NBR: Acrylonitrile-butadiene rubber.
4. PTFE: Polytetrafluoroethylene plastic.
5. SWP: Steam working pressure.
6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.1 for power piping valves andASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
3. Handwheel: For valves other than quarter-turn types.
4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.

a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE ANGLE VALVES

A. Manufacturers:

1. Type 2, Bronze Angle Valves with Nonmetallic Disc:
   a. Crane Co.
   b. Grinnell Corporation.

c. Hammond Valve.
d. NIBCO INC.

B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 2, Class 150, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc.

2.4 CAST-IRON ANGLE VALVES

A. Manufacturers:

1. Type II, Cast-Iron Angle Valves with Metal Seats:

a. Crane Co.
b. NIBCO INC.

B. Cast-Iron Angle Valves, General: MSS SP-85, Type II.

C. Class 125, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.

2.5 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. Two-Piece, Copper-Alloy Ball Valves:

a. Conbraco Industries, Inc.; Apollo Div.
b. Crane Co.
c. Grinnell Corporation.
d. Hammond Valve.
e. Jamesbury, Inc.
f. Kitz Corporation of America.
g. Legend Valve & Fitting, Inc.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Red-White Valve Corp.
k. Watts Industries, Inc.; Water Products Div.

2. Safety-Exhaust, Copper-Alloy Ball Valves:

a. Conbraco Industries, Inc.; Apollo Div.
b. Grinnell Corporation.
c. Hammond Valve.
d. Jamesbury, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

D. Safety-Exhaust, Copper-Alloy Ball Valves: Two-piece bronze body with exhaust vent opening, chrome-plated ball with vent, blowout-proof stem, locking handle, and working pressure rating of 600-psig CWP.

2.6 FERROUS-ALLOY BALL VALVES

A. Manufacturers:
1. Conbraco Industries, Inc.; Apollo Div.
2. Crane Co.
3. Hammond Valve.
4. Jamesbury, Inc.
5. Kitz Corporation of America.
6. Milwaukee Valve Company.
7. NIBCO INC.

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 150, full port.

2.7 FERROUS-ALLOY BUTTERFLY VALVES

A. Manufacturers:

1. Single-Flange, Ferrous-Alloy Butterfly Valves:
   a. Bray International, Inc.
   b. Crane Co.
   c. Grinnell Corporation.
   d. Hammond Valve.
   e. Kitz Corporation of America.
   f. Legend Valve & Fitting, Inc.
   g. Metraflex Co.
   h. Milwaukee Valve Company.
   i. Mueller.
   j. NIBCO INC.
   k. Red-White Valve Corp.
   l. Tyco International.
   m. Watts Industries.

2. Grooved-End, Ductile-Iron Butterfly Valves:
   a. Grinnell Corporation.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. Mueller.
   e. NIBCO INC.
   f. Victaulic Co. of America.

B. Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining suitable for potable water, unless otherwise indicated.

C. Single-Flange, 150-psig (1035-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.

D. Grooved-End, 175-psig (1207-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends.

2.8 BRONZE CHECK VALVES

A. Manufacturers:

1. Type 2, Bronze, Horizontal Lift Check Valves with Nonmetallic Disc:
   a. Crane Co.

2. Type 2, Bronze, Vertical Lift Check Valves with Nonmetallic Disc:

   a. Grinnell Corporation.
   b. Kitz Corporation of America.
   c. Milwaukee Valve Company.

3. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Red-White Valve Corp.
   g. Watts Industries.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 2, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

D. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

E. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.9 GRAY-IRON SWING CHECK VALVES

A. Manufacturers:

1. Type II, Gray-Iron Swing Check Valves with Composition to Metal Seats:

   a. Crane Co.
   b. Mueller Co.

c. Watts Industries.

2. Grooved-End, Ductile-Iron Swing Check Valves:

a. Grinnell Corporation.
b. Mueller Co.
c. Victaulic Co. of America.

B. Gray-Iron Swing Check Valves, General: MSS SP-71.

C. Type II, Class 125, gray-iron, swing check valves with composition to metal seats.

D. 175-psig (1207-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

2.10 FERROUS-ALLOY WAFER CHECK VALVES

A. Manufacturers:

1. Dual-Plate, Ferrous-Alloy, Wafer Check Valves:

a. Crane Co.
b. Grinnell Corporation.
c. Metraflex Co.
d. Mueller.
e. NIBCO INC.
f. Red-White Valve Corp.
g. Watts Industries.

B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

C. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.

2.11 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Manufacturers:

1. Type II, Compact-Wafer, Lift-Disc Check Valves:
a. Grinnell Corporation.
b. Hammond Valve.
c. Metraflex Co.
d. Milwaukee Valve Company.
e. Mueller.
f. NIBCO INC.

2. Type IV, Threaded Lift-Disc Check Valves:
a. Grinnell Corporation.
b. Legend Valve & Fitting, Inc.
c. Metraflex Co.
d. Milwaukee Valve Company.

e. Mueller.
f. NIBCO INC.
g. Watts Industries.

B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

C. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

D. Type IV, Class 150, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.12 BRONZE GATE VALVES

A. Manufacturers:

1. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Kitz Corporation of America.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corp.

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge.

2.13 CAST-IRON GATE VALVES

A. Manufacturers:

1. Type I, Cast-Iron, Nonrising-Stem Gate Valves:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Kitz Corporation of America.
   e. Legend Valve & Fitting, Inc.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corp.
   i. Watts Industries.

B. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

C. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

2.14 BRONZE GLOBE VALVES

A. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Kitz Corporation of America.
   e. Legend Valve & Fitting, Inc.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corp.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Kitz Corporation of America.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corp.

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc.

D. Type 2, Class 150, Bronze Globe Valves: Bronze body with nonmetallic PTFE or TFE disc.

2.15 CAST-IRON GLOBE VALVES

A. Manufacturers:

1. Type I, Cast-Iron Globe Valves with Metal Seats:
   a. Crane Co.
   b. Grinnell Corporation.
   c. Hammond Valve.
   d. Kitz Corporation of America.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corp.

B. Cast-Iron Globe Valves, General: MSS SP-85.

C. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

2.16 CHAINWHEEL ACTUATORS

A. Manufacturers:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries, Inc.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve. Include zinc coating on exterior applications.
2. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
3. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, gate, or plug valves.
2. Throttling Service: Angle, ball, butterfly, or globe valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Chilled-Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.

2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 600-psig (4140-kPa) CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Single-flange, 150-psig (1035-kPa) CWP rating, ferrous alloy, with Buta-N liner.
6. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: 300-psig (2070-kPa) CWP rating.
7. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal or vertical, bronze.
8. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
9. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
10. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) CWP rating.
11. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Dual-plate, wafer, Class 125 or 150 ferrous alloy.
12. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
13. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, cast iron.
14. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
15. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
16. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
17. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

D. Condenser Water Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
3. Butterfly Valves, NPS 2-1/2 and Larger: Single-flange, 150-psig CWP rating, ferrous alloy, with Buta-N liner.
4. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 and Larger: 300-psig CWP rating.
5. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 150, horizontal or vertical, bronze.
6. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
7. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
8. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
9. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer, Class 125 or 150, ferrous alloy.
10. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 150.
11. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
12. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
13. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
14. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
15. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted cast iron.

E. Domestic Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.

3. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 and Larger: Single-flange, 150-psig CWP rating, ferrous alloy, with EPDM liner.
6. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 and Larger: 300-psig CWP rating.
7. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 150, horizontal or vertical, bronze.
8. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
9. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
10. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
11. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer, Class 125 or 150, ferrous alloy.
12. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 150.
13. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
14. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
15. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
16. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
17. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted cast iron.

F. Heating Water Piping: Use the following types of valves:

1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
3. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
5. Butterfly Valves, NPS 2-1/2 and Larger: Single-flange, 150-psig CWP rating, ferrous alloy, with EPDM liner.
6. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 and Larger: 300-psig CWP rating.
7. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 150, horizontal vertical, bronze.
8. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
9. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.
10. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 and Larger: 175-psig CWP rating.
11. Wafer Check Valves, NPS 2-1/2 and Larger: Dual-plate, wafer, Class 125 or 150, ferrous alloy.
12. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 150.
13. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, cast iron.
14. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
15. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
16. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
17. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, bronze-mounted cast iron.

G. Sanitary Waste and Storm Drainage Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.
2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
3. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
4. Swing Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 125, gray iron.
5. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 and Larger: 175-psig minimum CWP rating.
6. Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.

7. Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, NRS, bronze-mounted cast iron.
8. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
9. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 125, cast iron.

H. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for heating hot water.
2. For Copper Tubing, NPS 2-1/2 (DN65) and larger: Flanged ends.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 (DN65) and larger: Flanged ends.
5. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved. Do not use for steam or steam condensate piping.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install chainwheel operators on valves and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor elevation.

G. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 15110

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes domestic water piping inside the building.

B. Water meters will be furnished and installed by utility company.

C. Related Sections include the following:
   1. Division 2 Section "Water Distribution" for water-service piping outside the building from source to the point where water-service piping enters the building.
   2. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 80 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Water Samples: Specified in Part 3 "Cleaning" Article.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, Schedule 40, galvanized. Include ends matching joining method.
   1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
   2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body, with ball-and-socket, metal-to-metal, bronze seating surface and female threaded ends.
   3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
   4. Cast-Iron Flanges: ASME B16.1, Class 125.
   5. Cast-Iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
   6. Steel-Piping, Grooved-End Fittings: ASTM A 47/A 47M, galvanized, malleable-iron casting; ASTM A 106, galvanized steel pipe; or ASTM A 536, galvanized, ductile-iron casting; with dimensions matching steel pipe.
      a. Grooved-End-Pipe Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
   7. Steel-Piping, Expansion Joints: Compound, galvanized steel fitting with telescoping body and slip-pipe section. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe sections, and flanged ends.
   8. Steel-Piping, Double Expansion Joints: Compound, galvanized steel fitting with telescoping body and two slip-pipe sections. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe sections, and flanged ends.

2.3 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A), water tube, annealed temper.
   1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
   3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.
   1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
   a. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.4 PVC PIPE AND FITTINGS

A. PVC Schedule 40 Pipe: ASTM D1785.
   1. PVC Schedule 40 Fittings: ASTM D2466, socket type.

2.5 VALVES

A. Bronze and cast-iron, general-duty valves are specified in Division 15 Section "Valves."

B. Balancing and drain valves are specified in Division 15 Section "Plumbing Specialties."

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Underground, Water-Service Piping on Service Side of Water Meter: Refer to Division 2 Section "Water Distribution."

F. Underground, water-service piping on house side of water meter. Use any of the following piping materials:
   1. PVC Schedule 40 Pipe: ASTM D1785.
      a. PVC Schedule 40 Fittings: ASTM D2466, socket type.
   2. Soft copper tube, type K (type A); copper pressure fittings; and soldered joints.

G. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 (DN 100) and Smaller: Soft copper tube, Type K (Type A); copper pressure fittings; and soldered joints.

H. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:
1. NPS 3 (DN 80) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
2. NPS 4 to NPS 6 (DN 100 to DN 150): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
3. NPS 4 to NPS 8 (DN 100 to DN 200): Hard copper tube, Type L (Type B) with grooved ends; copper grooved-end fittings; grooved-end-tube couplings; and grooved joints.
4. NPS 8 to NPS 12 (DN 200 to DN 300): Steel pipe; gray-iron, threaded fittings; and threaded joints.
5. NPS 8 to NPS 12 (DN 200 to DN 300): Steel pipe with grooved ends; steel-piping, grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Division 15 Section "Plumbing Specialties."

3.4 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.

E. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 15 Section "Plumbing Specialties."

F. Install domestic water piping level and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

3.5 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports." Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet (30 m): MSS Type 49, spring cushion rolls, if indicated.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
   2. NPS 6 (DN 150): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.
   3. NPS 8 to NPS 12 (DN 200 to DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.

F. Install supports for vertical steel piping every 15 feet (4.5 m).

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
   2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
   3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
   4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
   5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
   6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
   7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

H. Install supports for vertical copper tubing every 10 feet (3 m).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
   1. Booster Pumps: Cold-water suction and discharge piping.
   2. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
   4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:
   1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:
      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 15140

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections include the following:

1. Division 15 Section "Chemical-Waste Piping" for chemical-waste and vent piping systems.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. PE: Polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:
1. Sovent Drainage System: Include plans, elevations, sections, and details.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Lead and Oakum: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

C. Rigid, Unshielded Couplings: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.5 SPECIAL PIPE FITTINGS

A. Sovent Drainage System Fittings: ASME B16.45 or ASSE 1043, cast-iron aerator and deaerator fittings.

B. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

F. Tubular Fittings: ASTM F 409, PVC drainage-pattern tube and tubular fittings with ends as required for application.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.

B. Form: tube.

C. Color: Black.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Piping installed in building plenums shall meet requirements of materials within ducts or plenums (ceiling spaces used as supply or return air plenums) and shall have a flame-spread index of not more than 25 and a smoke-developed rating of not more than 50 when tested in accordance with the test for Surface Burning Characteristics of Materials.

C. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Aboveground, vent piping all sizes shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

F. Above and belowground, sovent drainage system with soil, waste, and vent piping materials indicated.

G. Underground, soil, waste, and vent piping all sizes shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, cast-iron couplings; and hubless-coupling joints.
3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

I. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

L. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

E. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

F. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 15 Section "Valves."

B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Horizontal Piping: Horizontal backwater valves.
2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Backwater valve are specified in Division 15 Section "Plumbing Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and 5 (DN 100 and 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

H. Install supports for vertical PVC piping every 48 inches (1200 mm).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 15150

SECTION 15160 - FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

B. Related Section:

1. Section "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. Fernco Inc.
d. Matco-Norca, Inc.
e. MIFAB, Inc.
f. Mission Rubber Company; a division of MCP Industries, Inc.
g. Stant.
h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

a. ANACO-Husky.
b. Clamp-All Corp.
c. Dallas Specialty & Mfg. Co.
d. MIFAB, Inc.
e. Mission Rubber Company; a division of MCP Industries, Inc.
f. Stant.
g. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent Cement: ASTM D 2564.

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Mission Rubber Company; a division of MCP Industries, Inc.
4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company; a division of MCP Industries, Inc.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 15 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping

upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: **2 percent** downward in direction of flow for piping NPS 3 (DN 80) and smaller; **2 percent** downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Storm-Drainage Piping: **2 percent** downward in direction of flow.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

M. Install aboveground PVC piping according to ASTM D 2665.

N. Install underground **PVC** piping according to ASTM D 2321.

O. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping.
2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Install drains in storm drainage gravity-flow piping.

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 15 Section "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 15 Section "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 15 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

C. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: **Shielded**, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves.
2. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Division 15 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install **carbon-steel** pipe hangers for horizontal piping in noncorrosive environments.
2. Install **stainless-steel** pipe hangers for horizontal piping in corrosive environments.
3. Install **carbon-steel** pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.
6. Spacing for 10-foot (3-m) pipe lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

G. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

H. Install hangers for **PVC** piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 10 and NPS 12 (DN 250 and DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

I. Install supports for vertical **PVC** piping every 48 inches (1200 mm).

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Install horizontal backwater valves **with cleanout cover flush with floor**.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.8 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 15 Section "Mechanical Identification."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping[**, except outside leaders,**] on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.10 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping **NPS 6 (DN 150) and smaller** shall be the following:
   1. Hubless, cast-iron soil pipe and fittings; **CISPI,** hubless-piping couplings; and coupled joints.

C. Aboveground, storm drainage piping **NPS 8 (DN 200) and larger** shall be the following:
   1. Hubless, cast-iron soil pipe and fittings; **CISPI,** hubless-piping couplings; and coupled joints.

D. Underground storm drainage piping **NPS 6 (DN 150) and smaller** shall be the following:
   1. **Solid-wall** PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Underground, storm drainage piping **NPS 8 (DN 200) and larger** shall be the following:
   1. **Solid-wall** PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 15160

SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

B. Related Sections include the following:

1. Division 7 Section "Roof Accessories" for roof curbs, piping supports, and roof penetration boots.
2. Division 7 Section "Through-Penetration Firestop Systems" for materials and methods for sealing pipe penetrations through fire and smoke barriers.
3. Division 7 Section "Joint Sealants" for materials and methods for sealing pipe penetrations through exterior walls.
4. Division 15 Section "Hangers and Supports" for pipe supports and installation requirements.
5. Division 15 Section "Mechanical Identification" for labeling and identifying refrigerant piping.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

C. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

1.5 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 7 Section "Through-Penetration Firestop Systems" for materials and methods for sealing pipe penetrations through fire and smoke barriers.

E. Coordinate pipe fitting pressure classes with products specified in related Sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide products by one of the following:

1. Refrigerants:

    a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
    b. DuPont Company; Fluorochemicals Div.
    c. Elf Atochem North America, Inc.; Fluorocarbon Div.
    d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.

2. Refrigerant Valves and Specialties:

    a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
    b. Danfoss Electronics, Inc.
    c. Emerson Electric Company; Alco Controls Div.
    d. Henry Valve Company.

e. Sporlan Valve Company.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: **ASTM B 88, Type L**.

B. Annealed-Temper Copper Tube: **ASTM B 88, Type L**.

C. Wrought-Copper Fittings: ASME B16.22.

D. Wrought-Copper Unions: ASME B16.22.

E. Brazing Filler Metals: AWS A5.8, Classification **BAg-1 (silver)**

2.3 VALVES

A. Service Valves: 500-psig (3450-kPa) pressure rating; forged-brass body with copper stubs, brass caps, removable valve core, integral ball check valve, and with solder-end connections.

B. Thermostatic Expansion Valves: Comply with ARI 750; brass body with stainless-steel parts; thermostatic-adjustable, modulating type; size and operating characteristics as recommended by manufacturer of evaporator, and factory set for superheat requirements; solder-end connections; with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.

2.4 REFRIGERANT PIPING SPECIALITIES

A. Moisture/Liquid Indicators: 500-psig (3450-kPa) maximum working pressure and 200 deg F (93 deg C) operating temperature; all-brass body with replaceable, polished, optical viewing window with color-coded moisture indicator; with solder-end connections.

B. Replaceable-Core Filter-Dryers (For Systems Above 12-1/2 Tons): 500-psig (3450-kPa) maximum working pressure; heavy gage protected with corrosion-resistant-painted steel shell, flanged ring and spring, ductile-iron cover plate with steel cap screws; wrought-copper fittings for solder-end connections; with replaceable-core kit, including gaskets and the following:

1. Filter Cartridge: Pleated media with integral end rings, stainless-steel support, ARI 730 rated for capacity.
2. Filter-Dryer Cartridge: Pleated media with solid-core sieve with activated alumina, ARI 730 rated for capacity.
3. Wax Removal Cartridge: Molded, bonded core of activated charcoal and desiccant with integral gaskets.

C. Permanent Filter-Dryer: 350-psig (2410-kPa) maximum operating pressure and 225 deg F (107 deg C) maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, within Building: **Type L (Type B) drawn-copper tubing**.

B. Belowground for NPS 2 (DN 50) and Smaller: **Type K** annealed-copper tubing.

3.2 VALVE APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor, for gage taps at hot-gas bypass regulators, on each side of strainers.

B. Install packed-angle valve in liquid line between receiver shutoff valve and thermostatic expansion valve for system charging.

C. (For Systems Above 12-1/2 Tons) Install a full-sized, three-valve bypass around each dryer.

D. Install thermostatic expansion valves as close as possible to evaporator.

1. If refrigerant distributors are used, install them directly on expansion-valve outlet.
2. Install valve so diaphragm case is warmer than bulb.
3. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3.3 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

F. Belowground, install copper tubing in protective conduit.

G. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

H. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

J. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

K. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."

L. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6.0 m) long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6.0 m) or longer.
3. Pipe rollers for multiple horizontal runs 20 feet (6.0 m) or longer, supported by a trapeze.
4. Spring hangers to support vertical runs.

M. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).
8. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
9. NPS 4 (DN 100): Maximum span, 12 feet (3.7 m); minimum rod size, 1/2 inch (13 mm).

N. Support vertical runs at each floor.

3.4 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 15 Section "Basic Mechanical Materials and Methods."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.5 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.

1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.

    a. System shall maintain test pressure at the manifold gage throughout duration of test.
    b. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
    c. Fill system with nitrogen to raise a test pressure of 150 psig (1035 kPa) or higher as required by authorities having jurisdiction.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

3.7 CLEANING

A. Before installing copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.8 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
   2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
   3. Charge system providing full-operating charge.

END OF SECTION 15183

SECTION 15194 - FUEL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fuel gas piping within the building. Products include the following:

1. Pipe, tube, fittings, and joining materials.
2. Protective pipe and fitting coating.
3. Piping specialties.
4. Specialty valves.
5. Pressure regulators.

1.3 PROJECT CONDITIONS

A. Gas System Pressure: One pressure range. **0.5 psig (3.45 kPa) or less**.

B. Design values of fuel gas supplied for these systems are as follows:

1. Nominal Heating Value: 1000 Btu/cu. ft.
2. Nominal Specific Gravity: 0.6.

1.4 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.

B. Qualification Data: For qualified professional engineer.

C. Welding certificates.

D. Field quality-control reports.

E. Operation and Maintenance Data: For **motorized gas valves** and **pressure regulators** to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 CORRUGATED, STAINLESS-STEEL TUBING SYSTEMS

A. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: **provide products by one of the following**:

    a. OmegaFlex, Inc.; Tracpipe Division
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.; Gastite
    d. Tru-Flex Metal Hose Corp.
    e. Wardflex

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.

    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

        1) Flame-Spread Index: **25** or less.
        2) Smoke-Developed Index: **50** or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig (34.5 kPa).

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
6. Joint Compound and Tape: Suitable for natural gas.
7. Steel Flanges and Flanged Fittings: ASME B16.5.
8. Gasket Material: Thickness, material, and type suitable for natural gas.

2.4 POLYETHYLENE PIPING (FOR BELOW GROUND USE ONLY)

A. Piping: Pipe SDR 11, ASTM D 1248 and ASTM D 2513, 100 psi rated working pressure.

B. Fittings: ASTM D 1248 and ASTM D 2513, SDR 11, 100 psi rated working pressure.

C. Joints: Butt fusion, in accordance with manufacturer's recommendations and the Department of Transportation Title 49 of Federal Specifications, paragraph 192.285, as it applied to heat fusion.

D. Transition Fitting: Epoxy coated, Schedule 40 steel pipe with 17 LB anode by SDR 11 polyethylene pipe conforming to ASTM D2513, ASTM D638, and DOT 192.283. Manufactured by Perfection Corporation or approved equal.

2.5 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in contact with materials that may corrode the pipe.

2.6 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.7 SPECIALTY VALVES

A. Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig (13.8-kPa) minimum pressure rating.

1. Tamperproof Feature: Include design for locking.

D. Plug Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig (860-kPa) pressure rating.

1. Tamperproof Feature: Include design for locking.

E. General-Duty Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125-psig (860-kPa) pressure rating.

1. Gate Valves: MSS SP-70, OS&Y type with solid wedge.

2. Butterfly Valves: MSS SP-67, lug type with lever handle.

F. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed. Electrically Operated Gas Valves shall be provided in gas lines serving gas-fired cooking equipment located under kitchen hoods.

2.8 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

1. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
2. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
3. Service Pressure Regulators: ANSI Z21.80. Include 100-psig- minimum inlet pressure rating.
4. Line Pressure Regulators: ANSI Z21.80 with 5-psig- minimum inlet pressure rating.
5. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for fuel oil piping system to verify actual locations of piping connections before equipment installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.3 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.

1. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Dielectric fittings are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.4 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 2 psig (13.8 kPa) or Less:

1. NPS 1/2 (DN 15) to NPS2 (DN50): steel pipe, malleable-iron threaded fittings, and threaded joints.
2. NPS 2-1/2 (DN 65) and Larger: Steel pipe, steel welding fittings, and welded joints.

C. Fuel Gas Piping 2 to 5 psig (13.8 to 34.5 kPa):

1. NPS 2 (DN 50) and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
2. Larger Than NPS 2 (DN 50): Steel pipe, steel welding fittings, and welded joints.

D. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Provide protective coating. Prior to entry to building, polyethylene pipe may be used.

E. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

3.5 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig (3.45 kPa) or Less: Appliance connector valve or gas stop.

B. Appliance Shutoff Valves for Pressure 2 to 5 psig (13.8 to 34.5 kPa): Gas valve.

C. Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.

D. Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

E. Valves at Service Meter, NPS 2 (DN 50) and Smaller: Gas valve.

F. Valves at Service Meter, NPS 2-1/2 (DN 65) and Larger: Plug valve.

3.6 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. Above-Ceiling Locations: Gas piping may be installed in accessible non-plenum spaces, subject to approval of authorities having jurisdiction. Do not locate valves above ceilings.
2. In Floors: Gas piping shall be installed in a conduit of schedule 40 PVC or ABS pipe where the conduit originates and terminates within the same building. Conduit shall originate and terminate in an accessible portion of the building and shall not be sealed. Conduit shall extend minimum 2-inches above finished floor.
3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.
4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.

    a. Exception: Tubing passing through partitions or walls.

5. In Walls: Gas piping with welded joints and protective wrapping specified in Part 2 "Protective Coating" Article may be installed in masonry walls, subject to approval of authorities having jurisdiction.
6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

    a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches (75 mm) long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

J. Install strainer on inlet of each line pressure regulator and electrically operated valve.

K. Install pressure gage upstream and downstream from each line pressure regulator.

L. Install flanges on valves, specialties, and equipment having NPS 2-1/2 (DN 65) and larger connections.

M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

N. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches (100 mm) outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

O. Any exposed gas piping shall be primed and painted bright yellow.

3.7 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Use materials suitable for fuel gas.

1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F (540 deg C). Brazing alloys containing phosphorus are prohibited.

C. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.8 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support and equipment support materials and installation requirements are specified in Division 15 Section "Hangers and Supports."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (16 mm).

C. Install hangers for horizontal corrugated, stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): Maximum span, 48 inches (1219 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 3/4 and NPS 1 (DN 20 and DN 25): Maximum span, 72 inches (1829 mm); minimum rod size, 3/8 inch (10 mm).
3. Option: Support tubing from structure according to manufacturer's written instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches (1800 mm) of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment according to Division 16 Section "Grounding and Bonding."

1. Do not use gas pipe as grounding electrode.

F. Connect wiring according to Division 16 Section "Conductors and Cables."

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each pressure regulator and specialty valve.

1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
2. Nameplates, pipe identification, and signs are specified in Division 15 Section "Mechanical Identification."

3.11 PAINTING

A. Use materials and procedures in Division 9 painting Sections.

B. Paint exterior service meters, pressure regulators, and specialty valves.

1. Color: Gray.

C. Any exposed gas piping shall be primed and painted bright yellow.

3.12 FIELD QUALITY CONTROL

A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

D. Verify correct pressure settings for pressure regulators.

E. Verify that specified piping tests are complete.

END OF SECTION 15194

SECTION 15300 - PIPES, VALVES AND FITTINGS FOR FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Scope of work:
   1. All areas as indicated on the drawings are to be protected by an automatic suppression system, of type as indicated.
   2. Wet pipe.

B. Contractor shall be responsible for designing the distribution systems and sizing of the systems by hydraulic calculation; and shall provide the necessary engineering drawings and calculations to obtain acceptance of all authorities having jurisdiction.

1.2 RELATED SECTIONS

A. Section 07840 - Firestopping.

B. Section 08310 - Access Doors and Panels.

C. Section 15050 - Basic Mechanical Methods and Materials.

D. Section 15060 - Hangers and Supports.

E. Section 15500 - Piping Specialties.

1.3 REFERENCES

A. ASTM International (ASTM) A536 - Standard Specification for Ductile Iron Castings.

B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

C. NFPA 13 - Installation of sprinkler systems.

D. NFPA 72 - Installation, maintenance and use of protective signaling devices.

1.4 SYSTEM DESCRIPTION

A. System components to be UL listed/FM approved and labeled.

B. System components to be to be rated for minimum operating pressure of 175 psig.

C. Pipe, Valves, and Fittings - Grooved products for steel and copper fire protection systems shall be used. Refer to Section 15050 - Basic Materials and Methods and Section 15500 - Piping Specialties.

D. Products shall be UL/ULC listed and FM approved. Materials shall be installed in accordance with current NFPA Standards, local Rating Bureau and/or local Fire Marshall requirements.

E. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies. Refer to

Section 15060 - Hangers and Supports.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Installation methods.

C. Certifications:
1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.

D. Shop Drawings:
1. Submit shop drawings and Product Data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

E. Closeout Submittals:
1. Warranty: Warranty documents.
2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
1. Fire Protection Contractor shall be licensed by the State in which the project is located authorized to furnish and install fire protection systems.
2. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.

B. Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

1.7 DEFINITION

A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.

B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.

C. "Exposed" means not installed underground or "concealed" as defined above.

D. "Fire Protection Work" is all of the work Indicated or required by the Contract Documents.

E. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.

F. "Provide" means the Contractor shall "furnish and install" work and/or equipment.

G. "FPC" means the Fire Protection Contractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.

B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Manufacturers shall meet or exceed NFPA and local authority requirements.

2.2 MANUFACTURED UNITS

A. Grooved Butterfly Valve: Gruvlok Figure AE-7722-3A, 2 to 10 inches (51 mm to 254 mm). 300 PSI (2.1 MPa) rated UL/FM approved grooved-end with two (2) switches; one is a supervisory switch and the other is an auxiliary switch. Tamper resistant screws shall be provided to attach the cover of the actuator. Or Equal.

B. Check Valves: Gruvlok Figure 78FP, 2 to 12 inches (51 to 305 mm): 300 PSI (2.1 MPa) rated, UL/ULC listed and FM approved grooved-end.

C. Couplings for Fire Protections Systems - Gruvlok UL/ULC listed and/or FM approved. Figure 7000 (Flexible) and 7400 (Rigidlok) Grade "E" EPDM Type A, "C" Style Gaskets (DRI-SEAL), Type E EPDM, or Flush Gap Gasket. Or Equal.

D. Grooved Fittings for Fire Protection Piping Systems: Gruvlok Fire-Rite short pattern fittings, 90 degree elbows and tees in 2 to 8 inches (51 mm to 203 mm) or Gruvlok standard pattern fittings, 2 to 12 inches (51 to 305 mm). Cast ductile conforms to ASTM A-536 Ductile Iron to Grade 65-45-12. Fittings are painted to industry specification and are available galvanized. Fire-RiteSYMBOL 212 fittings are UL/ULC listed and FM approved. Or Equal.

2.3 SPRINKLER HEADS

A. Manufacturer:
1. Viking, Central, Reliable, Tyco or equal.
2. Type: Concealed fire sprinkler heads only (Shall be approved by architect for coordination of ceiling construction types).
a) Corrosive environments (pool areas, pump rooms, chemical storage, etc.) shall be pendant heads furnished with corrosion resistant sprinkler heads (wax over polyester coated finish)

2.4 PIPING

A. Steel Piping:
1. ASTM A795 steel pipe schedule 40 black iron piping.
a) Corrosive environments (pool areas, pump rooms, chemical storage, etc.) shall be furnished with schedule 40 galvanized piping.

2.5 ACCESS PANELS

A. Provide access panels as required by Section 08310 - Access Doors and Panels.

2.6 FIRESTOPPING MATERIALS

A. Provide fire stopping assemblies as required by Section 07840 - Firestopping.

2.7 EQUIPMENT SUPPORTS

A. Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05120 Structural Steel. Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

A. Provide templates to ensure accurate location of anchor bolts.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Contractor shall verify and obtain fire flow test data required for design.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Provide openings as necessary to permit installation of piping or any other part of work under this Section.

D. Provide sleeves for piping penetrating floor and masonry walls.

E. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.

F. All patching shall match adjacent surfaces.

G. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid disputes regarding the condition of existing surface before work began.

H. Openings through existing concrete shall be core-drilled or saw cut.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access panels for access to equipment, valves, or other specialties installed behind wall or above ceiling surfaces.

C. Lay-in acoustical tee bar ceilings and snap-in removable metal pan ceilings shall be considered adequate for access.

D. Fire Protection Contractor shall sublet installation work to subcontractors specifically skilled in the construction of the surfaces involved.

E. Contractor shall confer with the other Project Contractors with respect to access panel locations and shall, wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.

F. Contractor shall remove all markings and labels from access panels.

G. Cutting or drilling thru structural beams or joists is not permitted.

H. Provide all openings and set all sleeves in cooperation with Contractors whose work is affected thereby.

I. Caulk opening between pipe and sleeve with fire barrier sealant.

J. In event holes must be provided through reinforced concrete, they shall be carefully drilled so as to avoid spalling and unnecessary damage of weakening of any structural member; chopping or breaking out will not be permitted.

K. Obtain Architect's approval before providing openings through concrete or masonry in place and then proceed as directed.

L. Contractor shall be responsible for damage to finished work resulting from cutting or drilling required because of neglect of Contractor to provide accurate and sufficient information.

M. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur.

N. Comply with the manufacturer's requirements for proper installation of fire stop materials to obtain the required fire and/or smoke rating.

3.4 SPRINKLER HEADS

A. Locate sprinkler heads, main piping and valves as indicated on the drawings.

B. Install sprinkler heads to coordinate with all lights, grilles and any other obstructions in ceiling.

C. Center sprinkler heads in ceiling tile and provide piping offsets as required.

D. Where ceiling is to be painted or sprayed, apply paper cover over sprinkler heads to ensure the head and escutcheons do not get coated. Remove protective paper cover after painting or spraying is completed.

E. Provide mountable metal box of spare heads with proper wrench for head replacement.

3.5 TESTS AND INSPECTIONS

A. Contractor shall be responsible for testing and certification of systems and ordering inspections as required by authorities having jurisdiction.

B. All tests shall be conducted in the presence of and to the satisfaction of the Owner or an authorized representative.

C. Inspections shall be made by the Owner's authorized representative and inspectors having jurisdiction.

3.6 PROTECTION

A. After all tests have been made and the systems pronounced to be satisfactory, the Contractor shall go over all work and clean equipment, fixtures, and related appurtenances and piping, and leave them clean and in complete working order at final completion of the project.

B. Protect installed products until completion of project.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

B. Related Sections include the following:

1. Division 15 Section "Emergency Plumbing Fixtures."
2. Division 15 Section "Drinking Fountains and Water Coolers."
3. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Hand Sinks: NSF 2 construction.
3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
4. Slip-Resistant Bathing Surfaces: ASTM F 462.
5. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M.
6. Vitreous-China Fixtures: ASME A112.19.2M.
7. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
8. Water-Closet, Flushometer Tank Trim: ASSE 1037.

I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucet Hose: ASTM D 3901.
5. Faucets: ASME A112.18.1M.
6. Hose-Connection Vacuum Breakers: ASSE 1011.
7. Hose-Coupling Threads: ASME B1.20.7.

8. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
9. NSF Materials: NSF 61.
10. Pipe Threads: ASME B1.20.1.
11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
12. Supply and Drain Fittings: ASME A112.18.1M.

J. Comply with the following applicable standards and other requirements specified for bathtub and shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1M.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1M.
3. Manual-Operation Flushometers: ASSE 1037.
4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
5. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.

L. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Floor Drains: ASME A112.21.1M.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Plastic Shower Receptors: ANSI Z124.2.
7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Manufacturers" introduce a list of manufacturers, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet,: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

   1. Available Manufacturers:

      a. American Standard.

      b. T & S Brass.

      c. Kohler.

      d. Chicago.

   2. Refer to Plumbing Schedule for specification standards.

2.3 BATHTUB FAUCETS

A. Bathtub Faucet: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
   1. Manufacturers:

      a. American Standard.

      b. T & S Brass.

      c. Kohler.

      d. Chicago.

   2. Refer to Plumbing Schedule for specification standards.

2.4 SHOWER FAUCETS

A. Shower Faucet: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
   1. Manufacturers:

a. American Standard.

b. T & S Brass.

c. Kohler.

d. Chicago.

2. Refer to Plumbing Schedule for specification standards.

2.5 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturers:

a. American Standard.

b. T & S Brass.

c. Kohler.

d. Chicago.

2. Refer to Plumbing Schedule for specification standards.

2.6 FLUSHOMETERS

A. Flushometer: Cast-brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, and copper or brass tubing, and polished chrome-plated finish on exposed parts.
1. Manufacturers:

a. Sloan, Royal.

b. Zurn, Aquaflush, AT.

2. Refer to Plumbing Schedule for specification standards.

2.7 TOILET SEATS

A. Toilet Seat: Solid plastic.
1. Manufacturers:

a. Church.

b. American Standard.

c. Olsenite.

2. Refer to Plumbing Schedule for specification standards.

2.8 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
   1. Manufacturers:
      a. Plumerer.
      b. Truebro.
      c. McGuire.
      d. Engineered Brass.

2.9 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible or standard mounting height, as required. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
   1. Manufacturers:
      a. Josam.
      b. Mifab.
      c. Smith.
      d. Wade.
      e. Zurn.

B. Urinal Support: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.
   1. Manufacturers:
      a. Josam.
      b. Mifab.
      c. Smith.
      d. Wade.
      e. Zurn.
   2. Accessible Fixture Support: Include rectangular steel uprights.

C. Lavatory Support: Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
   1. Manufacturers:
      a. Josam.
      b. Mifab.
      c. Smith.
      d. Wade.
      e. Zurn.
   2. Accessible Fixture Support: Include rectangular steel uprights.

D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
   1. Manufacturers:
      a. Josam.
      b. Mifab.
      c. Smith.
      d. Wade.
      e. Zurn.

2.10 WATER CLOSETS

A. Water Closets,: Accessible and standard, wall hung and floor mounted, vitreous-china fixture designed for gravity-type tank, flushometer tank, or flushometer valve operation.
   1. Products:
      a. American Standard, Inc.
      b. Crane Plumbing/Fiat Products.
      c. Kohler Co.
      d. Eljer Plumbingware.
   2. Refer to Plumbing Schedule for Specification Standards.

2.11 URINALS

A. Urinals,: Accessible and standard Wall-hanging, bottom-outlet, vitreous-china fixture designed for flushometer valve operation.
   1. Products:
      a. American Standard.

b. Crane Plumbing/Fiat Products.
c. Kohler Co.
d. Eljer Plumbingware.
2. Refer to Plumbing Schedule for Specification Standards.

2.12 LAVATORIES

A. Lavatories: Accessible and standard, Wall-hanging, vitreous-china fixture.
1. Products:
a. American Standard, Inc.
b. Crane Plumbing/Fiat Products.
c. Kohler Co.
d. Eljer Plumbingware.
2. Refer to Plumbing Schedule for Specification Standards.

B. Lavatories: Accessible and Standard Counter-mounting, vitreous-china fixture.
1. Products:
a. American Standard, Inc.
b. Crane Plumbing/Fiat Products.
c. Kohler Co.
d. Eljer Plumbingware Div.
2. Refer to Plumbing Schedule for Specification Standards.

2.13 KITCHEN SINKS

A. Kitchen Sinks: Counter-mounting, stainless-steel fixture.
1. Products:
a. Elkay Manufacturing Co.
b. Just Manufacturing Co.
c. Kohler Co.
d. Sterling Plumbing Group, Inc.
2. Refer to Plumbing Schedule for Specifications Standards.

B. Bar Sinks: Single-compartment, counter-mounting, stainless-steel fixture.
1. Products:
a. Elkay Manufacturing Co.
b. Federal Home Products Div.
c. Just Manufacturing Co.
d. Kohler Co.
e. Sterling Plumbing Group, Inc.
2. Refer to Plumbing Schedule for Specifications Standards.

2.14 SERVICE BASINS

A. Service Basins,: Flush-to-wall, floor-mounting precast terrazzo basin with rim guard.

1. Available Products:
2. Products:

a. Acorn Engineering Co.
b. Crane Plumbing/Fiat Products.
c. Precast Terrazzo Enterprises, Inc.
d. Stern-Williams Co., Inc.

3. Refer to Plumbing Schedule for Specification Standards.

2.15 WASH FOUNTAINS

A. Wash Fountains,: Accessible, Circular, semi-circular, and flush-to-wall freestanding-design and wall-hung, wash-up fixture.
1. Products:

a. Acorn Engineering Co.
b. Bradley Corporation.
c. Intersan Manufacturing Co.

2. Refer to Plumbing Schedule for Specification Standards.

2.16 SERVICE SINKS

A. Service Sinks,: Trap-standard- and wall-mounting, enameled, cast iron with roll-rim sink with plain or two faucet holes in back and rim guard on front and sides.
1. Products:
a. Kohler Co.
b. Eljer Plumbingware.
c. Crane Plumbing/Fiat Products.
2. Refer to Plumbing Schedule for Specification Standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

T. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

U. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

V. Set bathtubs, shower receptors, and service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.

W. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15410

SECTION 15415 - DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Drinking fountains.
2. Water coolers.
3. Fixture supports.

1.3 DEFINITIONS

A. Accessible: Fixture that can be approached and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of fixture.

C. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.

D. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about fixtures for people with disabilities.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

1.6 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in other Part 2 articles.

2.2 WATER COOLERS

A. Water Coolers,: Accessible, ARI 1010, pressure with bubbler fixture.
   1. Products:

      a. Elkay Manufacturing Co.
      b. Halsey Taylor.
      c. Haws Corporation.
      d. Oasis Corp.

   2. Refer to Plumbing Schedule for specification standards.

2.3 FIXTURE SUPPORTS

A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, water-cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.
   1. Manufacturers:

      a. Josam Co.
      b. Smith.

c. Watts Industries, Inc.; Watts Drainage Products Div.
d. Zurn Specifications Drainage Operation.

2. Type I: Hanger-type carrier with two vertical uprights.
3. Type II: Bilevel, hanger-type carrier with three vertical uprights.
4. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.

B. Use mounting frames for recessed water coolers, unless otherwise indicated.

C. Set freestanding and pedestal drinking fountains on floor.

D. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Water-Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

C. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust water-cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. END OF SECTION 15415

SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following plumbing specialties:

1. Backflow preventers.
2. Dishwasher air-gap fittings.
3. Water regulators.
4. Balancing valves.
5. Thermostatic water mixing valves.
6. Water tempering valves.
7. Strainers.
8. Outlet boxes.
9. Washer-supply outlets.
10. Hose stations.
11. Key-operation hydrants.
12. Wheel-handle wall hydrants.
13. Nondraining nonfreeze post hydrants.
14. Trap seal primer valves.
15. Drain valves.
16. Backwater valves.
17. Miscellaneous piping specialties.
18. Sleeve penetration systems.
19. Flashing materials.
20. Cleanouts.
21. Floor drains.
22. Trench drains.
23. Roof drains.
24. Grease interceptors.
25. Oil interceptors.
26. Solids interceptors.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PE: Polyethylene plastic.
3. PUR: Polyurethane plastic.

4. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig (860 kPa).
2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
3. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Backflow preventers and water regulators.
2. Balancing valves and strainers.
3. Thermostatic water mixing valves and water tempering valves.
4. Water hammer arresters, air vents, and trap seal primer valves and systems.
5. Drain valves, hose bibbs, hydrants, and hose stations.
6. Outlet boxes and washer-supply outlets.
7. Backwater valves, cleanouts, floor drains, open receptors, trench drains, and roof drains.
8. Air-admittance valves, vent caps, vent terminals, and roof flashing assemblies.
9. Grease interceptors, oil interceptors, and solids interceptors.
10. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field test reports.

D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators.
2. Thermostatic water mixing valves and water tempering valves.
3. Trap seal primer valves and systems.
4. Hose stations and hydrants.
5. Grease interceptors, oil interceptors, and solids interceptors.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 BACKFLOW PREVENTERS

A. Available Manufacturers:

B. Manufacturers:
1. B & K Industries, Inc.
2. Cla-Val Co.
3. Conbraco Industries, Inc.
4. Mueller Co.; Hersey Meters Div.
5. Park Equipment.
6. Watts Industries, Inc.; Water Products Div.
7. Zurn Industries, Inc.; Wilkins Div.

C. General: ASSE standard, backflow preventers.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

    a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
5. Strainer: On inlet, if indicated.

D. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

E. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

F. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.

G. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

H. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

I. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

J. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and two independent check valves.

K. Dual-Check-Valve-Type Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, NPS 3/8 (DN 10).

L. Laboratory Faucet Vacuum Breakers: ASSE 1035, suitable for continuous pressure application and chrome plated; consisting of primary and secondary checks; intermediate vacuum breaker; and threaded ends, NPS 1/4 or NPS 3/8 (DN 8 or DN 10) as required.

M. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves; and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

N. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

O. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm (0.19-L/s) flow and applications with up to 10-foot head of water (30-kPa) back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.

P. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.3 DISHWASHER AIR-GAP FITTINGS

A. Description: ASSE 1021, fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body, chrome-plated brass cover; and capacity of at least 5 gpm (0.32 L/s); and inlet pressure of at least 5 psig (35 kPa) at temperature of at least 140 deg F (60 deg C). Include 5/8-inch- (16-mm-) ID inlet and 7/8-inch- (22-mm-) ID outlet hose connections.

B. Hoses: Rubber and suitable for temperature of at least 140 deg F (60 deg C).

1. Inlet Hose: 5/8-inch- (16-mm-) ID and 48 inches long.
2. Outlet Hose: 7/8-inch- (22-mm-) ID and 48 inches long.

2.4 WATER REGULATORS

A. Available Manufacturers:
1. Cla-Val Co.
2. Conbraco Industries, Inc.
3. Watts Industries, Inc.; Water Products Div.
4. Zurn Industries, Inc.; Wilkins Div.

B. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig (1035 kPa) minimum. Include integral factory-installed or separate field-installed, Y-pattern strainer.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.

a. General-Duty Service: Single-seated, direct operated, unless otherwise indicated.
b. Booster Heater Water Supply: Single-seated, direct operated with integral bypass.

2. NPS 2-1/2 (DN 65) and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved, interior epoxy coating for regulators with cast-iron body.

a. Type: Single-seated, direct operated.
b. Type: Pilot-operated, single- or double-seated, cast-iron-body main valve, with bronze-body pilot valve.

3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

2.5 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

1. Available Manufacturers:

a. Amtrol, Inc.
b. Flow Design, Inc.
c. ITT Industries; Bell & Gossett Div.
d. Watts Industries, Inc.; Water Products Div.

2. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
4. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and Smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard or full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Available Manufacturers:

a. Conbraco Industries, Inc.
b. Crane Co.
c. Grinnell Corporation.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Red-White Valve Corp.

2.6 THERMOSTATIC WATER MIXING VALVES

A. Manufacturers:
1. Bradley.
2. Lawler Manufacturing Company, Inc.
3. Leonard Valve Company.
4. Powers.
5. Symmons Industries, Inc.
6. T & S Brass and Bronze Works, Inc.

B. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and thermometer. Refer to plumbing schedules for further information.

2.7 WATER TEMPERING VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Heat-Timer Corporation.
2. Holby Valve Co., Inc.
3. Sparco, Inc.
4. Watts Industries, Inc.; Water Products Div.

C. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

D. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.

1. Finish: [**Rough bronze**] [**Chrome plated**].

E. Limited-Volume, Water Tempering Valves: Solder-joint inlets and NPS 3/4 (DN 20) maximum outlet.

2.8 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.

a. Drain: Factory- or field-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Available Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Oatey.
4. Symmons Industries, Inc.
5. Zurn Industries, Inc.; Jonespec Div.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections and drain. Refer to plumbing schedules for further information.

D. Icemaker Outlet Boxes: With hose connection. Refer to plumbing schedules for further information.

E. Reinforcement: 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking between studs. Fire-retardant-treated-wood blocking is specified in Division 6 Section "Rough Carpentry."

2.10 HOSE STATIONS

A. Available Manufacturers:
1. Leonard Valve Company.
2. Strahman Valves, Inc.
3. T & S Brass and Bronze Works, Inc.

B. General: Assembly with fitting complying with ASME A112.18.1M and hose-connection outlet with threads complying with ASME B1.20.7. Refer to plumbing schedules for further information.

2.11 KEY-OPERATION HYDRANTS

A. Available Manufacturers:

1. Josam Co.
2. Simmons Manufacturing Co.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Industries, Inc.
6. Woodford Manufacturing Co.
7. Zurn Industries.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa). Refer to plumbing schedule for further information.

2.12 WHEEL-HANDLE WALL HYDRANTS

A. Available Manufacturers:
1. B & K Industries, Inc.
2. NIBCO INC.
3. Sioux Chief Manufacturing Co., Inc.
4. Watts Industries, Inc.; Water Products Div.
5. Woodford Manufacturing Co.
6. Zurn Industries, Inc.; Jonespec Div.

B. Refer to plumbing schedule for further information.

2.13 NONDRAINING NONFREEZE POST HYDRANTS

A. General: All-metal lever operation with nondraining water-storage reservoir, designed without drain and to be freezeproof with components of at least length required for burial of valve and water storage reservoir below frost line. Refer to plumbing schedule for further information.

2.14 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. Available Manufacturers:
   a. Josam Co.
   b. MIFAB Manufacturing, Inc.
   c. Precision Plumbing Products, Inc.
   d. Smith.
   e. Wade.
   f. Watts Industries, Inc.
   g. Zurn Industries.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:

1. Chrome-plated, cast-brass, NPS 1-1/4 (DN 32) minimum, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.

C. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:

1. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing inlet and manifold with number of NPS 1/2 (DN 15) outlets as indicated.

2. Cabinet: Steel box with stainless-steel cover.
3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
4. Water Hammer Arrester: ASSE 1010.
5. Vacuum Breaker: ASSE 1001.

2.15 DRAIN VALVES

A. Hose-End Drain Valves: MSS SP-110, NPS 3/4 (DN 20) ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded or solder joint.
2. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.

B. Hose-End Drain Valve: MSS SP-80, gate valve, Class 125, ASTM B 62 bronze body, with NPS 3/4 (DN 20) threaded or solder-joint inlet and ASME B1.20.7, garden-hose threads on outlet and cap. Hose bibbs are prohibited for this application.

C. Stop-and-Waste Drain Valves: MSS SP-110, ball valve, rated for 200-psig (1380-kPa) minimum CWP or MSS SP-80, Class 125, gate valve; ASTM B 62 bronze body, with NPS 1/8 (DN 6) side drain outlet and cap.

2.16 BACKWATER VALVES

A. Available Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Watts Industries, Inc.; Drainage Products Div.
4. Zurn Industries, Inc.; Specification Drainage Operation.

B. Horizontal Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.

1. Closed-Position Check Valve: Factory assembled or field modified to hang closed unless subject to backflow condition.
2. Open-Position Check Valve: Factory assembled or field modified to hang open for airflow.
3. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

C. Drain Outlet Backwater Valves: Cast-iron or bronze body, with removable ball float, threaded inlet, and threaded or spigot outlet for installation in bottom outlet of floor drain.

2.17 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.

1. Available Manufacturers:

    a. Josam Co.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe; Wade Div.
    d. Zurn Industries, Inc.; Specification Drainage Operation.

B. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

1. Available Manufacturers:
    a. Josam Co.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Watts Industries, Inc.
    e. Zurn Industries, Inc.

C. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

1. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
2. Finish for Service Areas: Rough bronze.
3. Finish for Finished Rooms: Chrome or nickel plated.
4. Operation for Equipment Rooms: Wheel handle or operating key.
5. Operation for Service Areas: Operating key.
6. Operation for Finished Rooms: Operating key.
7. Include operating key with each operating-key hose bibb.
8. Include wall flange with each chrome- or nickel-plated hose bibb.

D. Air Vents: Float type for automatic air venting.

1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded NPS 3/8 (DN 10) minimum inlet; 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C); and threaded vent outlet.
2. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 (DN 10) minimum inlet, 150-psig (1035-kPa) minimum pressure rating, and threaded vent outlet.

E. Air-Admittance Valves: Plastic housing with mechanical-operation sealing diaphragm, designed to admit air into drainage and vent piping and to prevent transmission of sewer gas into building.

1. Available Manufacturers:

    a. B & K Industries, Inc.
    b. IPS Corporation.
    c. J & B Products.
    d. Oatey.
    e. Sioux Chief Manufacturing Co., Inc.

2. Stack Vent Valve: ASSE 1050, designed for installation as terminal on soil, waste, and vent stacks, instead of stack vent extending through roof, in NPS 2 to NPS 4 (DN 50 to DN 100).
3. Fixture Vent Valve: ASSE 1051, designed for installation on waste piping, instead of vent connection, for single fixture, in NPS 1-1/4 to NPS 2 (DN 32 to DN 50).

F. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

1. Available Manufacturers:
2. Manufacturers:

   a. Acorn Engineering Company; Elmdor/Stoneman Div.

3. Open-Top Vent Cap: Without cap.
4. Low-Silhouette Vent Cap: With vandal-proof vent cap.
5. Extended Vent Cap: With field-installed, vandal-proof vent cap.

G. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting, joined with ASTM C 564, rubber gaskets.

H. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap seal primer valve connection.

1. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
2. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

I. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

J. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

K. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

L. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

M. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

N. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

O. Downspout Boots: ASTM A 48 (ASTM A 48M), gray-iron casting, with NPS 4 (DN 100) outlet; shop-applied bituminous coating; and inlet size to match downspout.

P. Downspout Boots: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.

Q. Conductor Nozzles: Bronze body with threaded inlet for connected conductor size, and bronze wall flange with mounting holes.

1. Finish: Nickel bronze.

2.18 SLEEVE PENETRATION SYSTEMS

A. Available Manufacturers:

1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.19 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152 (ASTM B 152M), of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.20 CLEANOUTS

A. Cleanouts,: Comply with ASME A112.3.1.

1. Application: Floor cleanout and wall cleanout.
2. Manufacturer:

    a. Josam Co.
    b. Smith.
    c. Wade.
    d. Zurn.
3. Refer to Plumbing Schedule for Specification Standards.

2.21 FLOOR DRAINS

A. Floor Drains,: Comply with ASME A112.3.1.

1. Application: Floor drain.
2. Manufacturer:

    a. Josam Co.
    b. MiFab.
    c. Smith.
    d. Wade Div.
    e. Zurn Industries.
3. Refer to Plumbing Schedule for Specification Standards.

2.22 TRENCH DRAINS

A. Trench Drains: Comply with ASME A112.3.1.
1. Manufacturer:

    a. Josam Co.
    b. Smith.
    c. Wade Div.
    d. Zurn Industries.
2. Refer to Plumbing Schedule for Specification Standards.

2.23 ROOF DRAINS

A. Roof Drains,: Comply with ASME A112.3.1.

1. Application: Roof drain.
2. Manufacturer:

a. Josam Co.
b. Smith.
c. Wade Div.
d. Zurn Industries.

3. Refer to Plumbing Schedule for Specification Standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

E. Install draining-type ground and ground post hydrants with 1 cu. yd. of crushed gravel around drain hole.

1. Set ground hydrants with box flush with grade.
2. Set post hydrants in concrete paving or in 1 cu. ft. of concrete block at grade.

F. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

G. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

H. Install expansion joints on vertical risers, stacks, and conductors if indicated.

I. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

J. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

K. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

L. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

M. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

N. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

O. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

P. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.

2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
5. Coordinate oil-interceptor storage tank and gravity drain with Division 2 Section "Fuel-Oil Distribution."

Q. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

R. Fasten recessed-type plumbing specialties to reinforcement built into walls.

S. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

T. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

U. Install air vents at piping high points. Include ball, gate, or globe valve in inlet.

V. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

W. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect plumbing specialties to piping specified in other Division 15 Sections.

D. Ground equipment.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

2. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.
3. Solids Interceptors: Connect inlet and outlet.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer thermostatic water mixing valve water tempering valve grease interceptor and oil interceptor.

1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
2. Refer to Division 15 Section "Basic Mechanical Materials and Methods Mechanical Identification" for nameplates and signs.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15430

Section 15732 - Rooftop Air Conditioners

Part 1 - General

1.01 Related Documents

1.02 General Description

A. This section includes the design, controls and installation requirements for packaged rooftop units / outdoor air handling units.

1.03 Quality Assurance

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.

B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

D. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

E. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

F. Unit shall be approved for use in and outside High Velocity Hurricane Zones (HVHZ) by the Florida Building Code (FL# 15031), when using the required steel rooftop curb and attachment methods.Maximum allowable lateral wind pressure is +100psf/-100psf. Maximum allowable uplift is +50psf/-50psf. Positive and negative required design pressures calculated for use with this system shall be determined by others on a job specific basis,in accordance with the governing code. Site specific pressures shall be less than or equal to the listed positive or negative allowable lateral wind design pressure and allowable uplift values for the product.

1.04 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories,electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specificdesign operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.05 Delivery, Storage, and Handling

A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent

damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.06 Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less.Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for Installation, Operation, and maintenance have been followed.Warranty excludes parts associated with routine maintenance, such as belts and filters.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:

1. Aaon, Inc
2. Addison
3. York, Johnson Controls
4. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Variable capacity compressor with 10-100% capacity control
   c. Direct drive supply fans
   d. Double wall cabinet construction
   e. Insulation with a minimum R-value of 13
   f. Stainless steel drain pans

2.02 Rooftop Units

A. General Description

1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, electric heaters, and unit controls.
2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment’s literature pocket.

3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.

5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.

6. Installation, Operation, and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpointof the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

6. Access to filters, dampers, cooling coils, reheat coil, heaters, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.

7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

9. Unit shall be provided with base discharge and return air openings. All openings through

the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.

10. Unit shall include lifting lugs on the top of the unit.

11. Interior ceiling, floor, service doors, fan inlet cone, damper rack, and filter rack in the air stream are spray coated with a two-part polyurethane, heat baked coating. The coils, coil casings, condensate drain pans, damper blades and gears, fan wheel, fan motor, energy recovery wheel casing, and compressor cabinet are not coated. Option is intended for use in coastal saltwater conditions under the stress of heat, salt, sand and wind and is applicable to all corrosive environments where a polyurethane coating is acceptable. Coating withstands at least 2,500 hours when tested under ASTM B 117-95 requirements.

12. Unit base pan shall be provided with 1/2 inch thick foam insulation.

13. Unit shall include factory installed, painted galvanized steel condenser coil guards on the face of the condenser coil.

C. Electrical

1. Unit shall have a 5kAIC SCCR.

2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.

3. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.

4. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.

3. Motor shall include shaft grounding

E. Cooling Coils

1. Evaporator Coils

a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.

b. Coils shall have interlaced circuitry and shall be 6 row high capacity.

c. Coils shall be hydrogen or helium leak tested.

d. Coils shall be furnished with factory installed expansion valves.

e. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface

areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively(ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 6,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

F. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.

2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.

6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.

7. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.

8. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

9. Lag refrigeration circuit shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.

10. Reheat coil shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 6,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

G. Condensers

1. Air-Cooled Condenser

   a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.

   b. Coils shall be designed for use with R-410A refrigerant. Coils shall be aluminum fin with copper tube. **Microchannel is not acceptable.**

   c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

   d. Coils shall be hydrogen or helium leak tested.

   e. Condenser fans shall be high efficiency electrically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

   f. Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

   g. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively(ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing, with coating capable of withstanding at least 6,000 hours of salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

H. Electric Heating

1. Unit shall include an electric heater consisting of electric heating coils, fuses and a high temperature limit switch, with capacities as shown on the plans.

2. Electric heating coils shall be located in the reheat position downstream of the cooling coil.

3. Electric heater shall have full modulation capacity controlled by an SCR (Silicon Controlled Rectifier). A 0-10 VDC heating control signal shall be field provided to control the amount of heating.

I. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE MERV rating of 8, upstream of the cooling coil.

J. Outside Air/Economizer

1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled

by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

2. Economizer shall be furnished with return air CO2 override.

K. Controls

1. Factory Installed and Factory Provided Controller

a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

b. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

d. Variable Air Volume Controller

1. Unit shall utilize a variable capacity compressor system and a variable speed supply fan system to modulate cooling and airflow as required to meet space temperature cooling loads and to save operating energy. Supply fan speed shall modulate based on supply air duct static pressure. Cooling capacity shall modulate based on supply air temperature.

2. Hot gas bypass shall be required on the lead refrigeration circuits of systems without variable capacity compressors.

3. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.

4. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Modulating heating capacity shall modulate based on supply air temperature.

e. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a BACnet network.

L. Accessories

1. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector which shuts off the unit's control circuit.

2.03 Curbs

A. Curbs shall 14” tall, fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

B. Curbs shall be provided with 1” spring isolation.

C. Curb shall be insulated with sound attenuation package of 4 layers of 4” mineral wool and 1/2” gypsum board.

D. Curb shall be wind load rated by a Texas PE.

Part 3 - Execution

3.01 3.01 Installation, Start Up, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Factory Authorized Representative shall provide on-site Start Up of the rooftop package unit and associated controls. A startup report shall be provided detailing the completion of work and initial settings. Startup and startup report to the owner shall include the following items.

i. Electrical Power

ii. Supply Fans

iii. Exhaust Fans

iv. Condenser Fans

v. Compressors

vi. Dampers

vii. Heater

D. Installing Contractor will schedule start up appointment with Factory Authorized Representative.

E. Factory Authorized Representative shall be located within 50 miles of jobsite.

F. Factory Authorized Service Technician shall be located within 30 miles of jobsite.

3.02 SERVICE AGREEMENT

A. Engage a factory-authorized service representative to perform maintenance as specified.

B. Service Agreement shall be for one (1) years with four (4) visits per year:

i. Two (2) Quarterly Visits Consisting of

1. Report in with the Customer Representative.
2. Review customer logs with the customer for operational problems and trends.
3. Inspect and clean drain pans.
4. Tighten electrical connections if required.
5. Inspect coils for dirt build-up.
6. Check that the P-trap is primed (filled with water). It is good practice to pour some water into the drain pan to ensure that the P-trap is primed and operational
7. Check and lubricate motor bearings. Refer to the motor manufacturer's instructions.
8. Check outdoor air louvres for accumulation of dust and clean as required.
9. Verify that all set-points are correctly programmed as specified by the facility operator.
10. Record and report abnormal conditions, measurements taken, etc.

ii. Two (2) Semi Annual Visit Consisting of

1. Report in with the Customer Representative.
2. Review customer logs with the customer for operational problems and trends.

3. Inspect the unit casing for corrosion. If damage is found, clean and repaint the affected surface with a rust-resistant primer.

4. Clean the fan wheel(s) and motor shaft(s).

5. Inspect and clean drain pans.

6. Check damper operation.

7. Inspect electrical components, wiring and insulation.

8. Rotate the fan wheel(s) and check for obstructions and rubbing.

9. Lubricate motors as directed by motor manufacturer.

10. Check gasket condition on all doors to ensure an airtight seal.

11. Check for loose external or internal parts, paying careful attention external components.

12. Check bolts on compressors, motor mounts, unit bases and coils and tighten if required.

13. Verify that the airflow around the condenser.

14. Wash and clean evaporator coils.

15. Wash and clean condenser coils.

16. Clean electric heater coils.

17. Record and report abnormal conditions, measurements taken, etc.

3.03 Training

A. Factory Authorized Representative shall provide on-site training to the owner. Training shall cover operation and maintenance of the package unit and all factory provide control items. The owner shall schedule the time and date directly with the Factory Authorized Representative.

B. Two (2) separate Eight (8.0) Hr trainings shall be provided.

i. 1st Training- During typical training cycle for new building systems.

ii. 2nd Training- At first filter change by owner.

END OF SECTION 15732

SECTION 15736 – DUCT-FREE SPLIT SYSTEMS

Part 1 – General

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections; apply to this Section

1.02 SUMMARY

A. This Section includes Inverter Driven variable capacity, heat pump air conditioning split system.
   1. Wall-mounted indoor units
   2. Ceiling-mounted indoor units
   3. Outdoor condensing units

1.03 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection
   1. Wiring Diagrams: Power, signal, and control wiring.
   2. Dimensioned outline drawings of equipment unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
C. Operation and Maintenance Data: For computer-room air-conditioning units to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
B. All wiring shall be in accordance with the National Electric Code (NEC).
C. The shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI label
D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
E. The outdoor unit will be factory charged for a length of 33 feet of refrigerant with R410A refrigerant.
F. A dry air holding charge shall be provided in the evaporator.

1.05 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.06 WARRANTY

A. Wall-mount units and associated condensing units:
   1. Units shall have a (5) year manufacturer's warranty from date of installation.
   2. Compressor shall have a (7) year manufacturer's warranty from date of installation
   3. Units shall have a (1) year limited labor warranty from date of installation.

B. Ceiling Cassette indoor units and associated condensing units:
    1. Units shall have a (1) year manufacturer's warranty from date of installation.
    2. Compressor shall have a (6) year manufacturer's warranty from date of installation
    3. Units shall have a (1) year limited labor warranty from date of installation.
C. During the stated period, should any part fail due to defects in material and/or workmanship, it shall be repaired or replaced. Manufacturer's labor warranty shall only cover the first year. Extended warranties are for parts only.

Part 2 – Performance

2.01 MANUFACTURERS
A. Daikin AC, contact Perry Mechanical Systems 956-683-1458
B. Samsung
C. Sanyo
D. TRANE
E. CARRIER
F. YORK

2.02 PERFORMANCE
A. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below.
B. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.
C. The heating performance is based on 70°F DB / 60°F WB for the indoor unit and 47°F DB / 43°F WB for the outdoor unit and 25 feet of piping.

2.03 INDOOR UNIT – WALL MOUNT (3/4-ton to 2-ton)
General:
The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units. The unit shall have a self diagnostic function, 3-minute time delay mechanism, and have a factory pre-charge of R410A adequate for 33 feet of total length.
A. Unit Cabinet:
    1. The indoor unit shall have a white, "flat screen" finish.
    2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom.
    3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
    4. The cabinet includes an "intelligent-eye" motion sensor capable of setting back the set point temperature for energy savings. This feature may be disengaged on the wireless remote controller.
B. Fan:
    1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
    2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
    3. Provide an auto-swing louver for adjustable air flow both vertically and horizontally via the wireless remote control furnished with each system.
    4. The indoor fan shall offer a choice of three speeds, High, Medium, and Low.
C. Filter:

1. The return air filter provided will be a mildew proof, removable and washable filter.

D. Coil:
   1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
   2. All tube joints shall be brazed with silver alloy or phoscopper.
   3. All coils shall be factory pressure tested.
   4. A condensate pan shall be provided under the coil with a drain connection.

E. Electrical:
   1. The outdoor unit shall be powered with 208/230 volts, 1 phase, and 60 hertz power. The indoor unit shall received 208/230 volt, 1 phase, 60 hertz power from the outdoor unit.
   2. The allowable voltage range shall be 187 volts to 253 volts.

F. Control:
   1. The unit shall have a wireless remote infra-red controller capable to operate the system. It shall have Automatic Operation, Dry Operation and Fan Only Operation.
   2. The infrared remote controller shall consist of an On/Off Power switch, Mode Selector, Silent Button (for outdoor unit), Fan Setting, Swing Louver, On/Off Timer Setting, Temperature Adjustment, “Intelligent Eye” sensor, Home Leave Operation, Powerful Operation.
      i. On/Off switch power the system on or off mode.
      ii. Mode selector shall operate the system in auto, cool, heat, fan or dry operation
      iii. Silent shall operation shall lower the sound level of the outdoor unit by slowing the inverter driven fan speed.
      iv. Fan setting shall provide high, medium or low fan speed.
      v. Swing louver shall adjust the airflow (horizontal and vertical) blades.
      vi. On/Off timer is used for automatically switching the unit on or off.
      vii. Temperature adjustment allows for the increase or decrease of the desired temperature.
      viii. Intelligent eye provides an infrared sensor which detects movement and adjusts the temperature by 3.6°F up or down depending on operating mode.
      ix. Home leave operation allows you to record your favorite temperature and airflow setting and allow the system to set back by 3°F.
      x. Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
   3. The infrared remote control shall perform Fault Diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
   4. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
   5. The system has automatic restart capability after a power failure has occurred.

G. A condensate pump shall be provided and field wired to the indoor unit where scheduled.

2.04 OUTDOOR UNIT (3/4-ton to 2-ton) FOR USE WITH WALL MOUNT INDOOR UNIT

General:

The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.

A. Unit Cabinet:
The cabinet shall be Ivory White with a finished powder coated backed enamel paint.
B. Fan
1. The fan shall be a direct drive, propeller type fan.
2. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
3. The fan shall be capable of operating in “silent operation” which lowers the outdoor fan speed in either cool, heat or auto modes.
4. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
5. Airflow shall be horizontal discharge.
C. Coil
1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
2. Refrigerant flow from the condenser will be controlled via a metering device.
3. A corrosion resistant coil fin tube shall be provided. Coating shall be an acrylic resin and hydrophilic film, epoxy coating or Copper tube/ Copper fin.
D. Compressor:
1. The compressor shall be rotary swing inverter-driven compressor.
2. The outdoor unit shall have an accumulator, four-way reversing valve.
3. The compressor shall have an internal thermal overload.
E. Electrical:
1. The electrical power requirement is 208/230 volt, 1-phase, and 60 Hz power.
2. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
3. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
4. Electrical power (208/230 volt) shall be provided to the indoor unit via the outdoor unit.
F. The operating range in cooling mode shall be 14°F DB to 115°F DB.
G. The operating range in heating mode shall be 0°F DB to 64°F DB.

2.05 INDOOR UNIT – CEILING CASSETTE UNIT (2-ton to 3-1/2 ton)

A. General:
The Daikin indoor unit shall be a ceiling cassette fan coil unit, operable with R410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grille. It shall use a four-way air distribution type, ivory white, impact resistant, and washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to maintain room temperature within 1°F. The Unit shall also be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with Daikin remote control BRC1C71 or BRC1D71.
B. Indoor Unit:
1. The Daikin indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The 4-way supply air flow shall be capable of field modification to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.

5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 21" of lift.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
9. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
4. Fresh air intake shall be possible by field cutting as described in Installation manual.
5. A branch duct knockout shall exist for branch ducting supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. Optional high efficiency air filters are available for each model unit.

D. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output of 0.12 HP.
3. The air flow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2 row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate shall be 1 -1/4 inch outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor shall be located on the liquid and gas line to facilitate Superheat control and PID temperature control logic.

G. Electrical:
1. A separate power supply shall be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have factory controls provided to perform input functions necessary to operate the system.
2. A full array of Fault Diagnostics shall be accessible via the Wired Remote Controller.

I. Accessories Required:
1. Remote “in-room” sensor kit (KRCS01-1).
i. A wall mounted, hard wired remote sensor kit is required for ceiling-embedded type fan coils. The sensor for detecting the temperature shall be placed away from the indoor unit (branch wiring shall be included in the kit.)

2.05 OUTDOOR UNIT (2-ton to 3-1/2 ton) FOR USE WITH CEILING CASSETTES

A. General: The outdoor condensing unit is designed specifically for use with matched capacity SkyAir series indoor evaporator units of the ceiling cassette style.
1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a scroll compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators.
2. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
3. The outdoor unit can be wired and piped with outdoor unit access from left, right, front or rear.
4. The sound pressure dB(A) at rated conditions shall be a value of 58 decibels at 3 feet from the front of the unit. The outdoor unit shall be capable of operating at further reduced noise during night time.
5. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
6. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
7. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.
8. The operating range in cooling mode shall be 23°F DB to 115°F DB
9. The operating range in heating mode shall be 0°F DB to 64°F DB

B. Unit Cabinet:
1. The outdoor unit model shall be completely weather proof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:
1. The condensing unit shall consist of two propeller type, direct-drive fan 70 W motors that have multiple speed operation via a DC inverter type.
2. The condensing unit fan motor shall have multiple speed operation of the DC inverter type.
3. The fan shall be a horizontal discharge configuration with an air flow of 3,740 cfm.
4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchanger, rifled bore tube design to ensure highly efficient performance.
3. The coils shall be complete with corrosion treatment of an acrylic resin type. The thickness of the coating must be between 2.0 to 3.0 microns. Alternative corrosion treatment shall be epoxy coated coils or Copper tube/Copper fin.

E. Compressor:
1. The scroll compressor shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC, hermetically sealed scroll type with a maximum speed of 6,480 rpm.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be 24% to 100%, with 20 individual capacity steps.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical:
1. The power supply to the outdoor unit shall be 208/230 volts, 1 phase, 60 hertz with a voltage range from 187 volts to 253 volts.
2. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable wire, thus simplifying the wiring operation.

15737 – Pool Dehumidification Units

Part 1 - General

1. **Scope**

   Furnish and install where indicated, factory-assembled, enclosed swimming pool environmental control/ energy recovery system. System shall include,

   Furnish and install, where indicated, a factory-assembled, fully-enclosed, split environmental control system with energy recovery feature(s) designed for natatorium environment control

   Features shall include:

   A. Dehumidification by means of a direct expansion evaporator coil
   B. Space heating by means of a packaged indirect-fired natural gas duct furnace module
   C. Cooling mode with heat rejection to a remote outdoor air cooled fluid cooler (dry-cooler). No field refrigeration work shall be required
   D. Pool water heating from reclaimed compressor waste heat
   E. Packaged minimum exhaust fan and purge fan with economizer mode
   F. Integral minimum outdoor air connection
   G. Integral purge outdoor air connection with economizer mode

2. **Quality and Safety Assurance**
   A. The complete unit shall be listed by an industry recognized, third-party, safety code agency under the title of "Special Purpose Air Conditioners" and carry the appropriate label.
   B. The system shall be ETL listed
   C. The system shall be completely assembled, wired, piped, and test-run at the factory prior to shipping. All controls shall be factory adjusted to satisfy the design conditions. A factory test report shall be available, upon request
   D. Manufacturer shall have a minimum of five-plus years prior experience making similar equipment as described in this specification.
   E. Wherever possible, the system shall have a mechanical vestibule where the electrical panel, compressor(s), pool water heat exchanger(s), receiver(s) and most of the refrigeration controls are out of the process air stream
   F. The system shall have a microprocessor controller with unit-mounted refrigerant pressure transducers on each refrigeration circuit, multiple temperature sensors and an Ethernet connection for factory logging and parameter adjustment via the Internet. The refrigerant pressure transducers shall be actively used for system control. The customer (or their authorized representative) shall be provided access to the online logging and parameter adjustment interface, upon request. Demonstration of these capabilities must be carried out at the engineer's office prior to bid day
   G. The system shall have remote factory start-up assistance capability, when connected to a network with Internet access
   H. The system shall have 24-7 remote computer logging capability with automated alarm notifications and system performance alerts transmitted via e-mail to authorized users, when connected to a network with Internet access
   I. Warranty: The entire system shall have a 24-month limited parts warranty from the factory ship date

1. A 1-year labor warranty shall be provided by the manufacturer when the system is connected to the factory via an Internet monitoring system from the date of initial commissioning
2. The compressor(s) shall have a 5-year warranty from the factory ship date
3. The internal airside heat exchanger coils shall have a 10-year warranty from the factory ship date
4. The drive line shall have a 5-year warranty from the factory ship date

J. When connected to a network with Internet access, the system shall have remote service capability with the ability for field service technicians to receive service and trouble alerts by e-mail and make parameter adjustments via a browser interface on any Internet-capable device

3. **Intent**
   A. It is the intent of this section of the specifications to provide a complete, operable, adjusted natatorium dehumidification system as shown and scheduled on the plans.
4. **Basis of Design**

A. Unit shall be Seresco NP Series
B. Base Bid/Alternate

Unit shall be base bid with Seresco NP Series. An Add or Deduct Alternate may be provided as indicated on the bid form subject to the following conditions:

1. Alternate bid shall include revised layout including details on supply/return air connections, piping connections, ventilation/exhaust connections, power/control wiring connections.
2. 10 day prior: Alternate Bid shall include Full Compliance Disclosure (by paragraph and schedule) to be submitted to the engineer ten days prior to the bid and approved by the engineer in writing prior to the bid. Full Disclosure shall clearly list and define any exceptions or deviations to the specified equipment and specified performance, and any items, which exceed the specifications. Alternate Bid Manufacturer shall include a full disclosure of the unit's energy recovery features including unit's reheat capabilities, pool water heating capabilities and recovery of pool water evaporation energy.
3. Where the intent of the specification is met but with different construction materials or methods, the difference shall be completely defined by paragraph in the Full Disclosure. The Full Disclosure shall include complete documented data.
4. Manufacturer shall submit the following bidder's checklist with his proposal to the mechanical contractor. It shall be the mechanical contractor's responsibility to provide any modifications to the equipment to make the unit conform to the specification.
5. Manufacturer shall have a certified, listed Manufacturer Representative within 10 miles of Pharr, TX.
6. Manufacturer Representative shall employ multiple qualified certified technicians with natatorium pool equipment experience.
7. Manufacturer Representative shall have trained technicians within 60 miles of jobsite.

Part 2 - Product

1. **General**

The natatorium control system shall include:

A. Mechanical process dehumidification
B. Indoor cabinet configuration
C. A packaged indirect-fired natural gas duct furnace module installed downstream of the blower, sized as specified by the design engineer to meet the skin losses and outdoor air heating loads
D. Coaxial condensing heat exchanger(s) for pool water heating using reclaimed compressor waste heat
E. Air filtration via MERV-8 2-inch pleated panel filters for return and outdoor air
F. Purge and economizer modes
G. Minimum exhaust and purge exhaust fan(s) with economizer mode
H. Programmable microprocessor controller with remote Internet logging and parameter adjustment
I. Remote operator panel(s)
J. Bacnet IP building management system interface
K. A service vestibule where the compressor, refrigeration specialties, control valves and all electronics are outside of process air stream

2. **Sequence of Operation**

The system shall be designed and sized to maintain the specified space conditions

A. System Startup
    1. Power is turned on or the system is restarted
    2. After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously
    3. Based on sensor feedback, the system shall begin or resume operation based on the sequence below
B. Airside Configuration
    1. The system continuously delivers the specified supply air volume to the natatorium
    2. The minimum exhaust air volume is set to meet the engineer's schedule.
    3. The minimum outdoor air volume is set to meet the engineer's schedule.
C. Dehumidification Mode
    1. The return air relative humidity is above the humidity setpoint
    2. The compressor enters the Compressor Start sequence
    3. If the system cannot maintain the relative humidity below setpoint, the second compressor circuit will start
    4. Compressor waste heat is rejected into a glycol fluid loop which feeds the reheat coils and the air conditioning air-cooled heat exchanger in parallel.
    5. The reheat coils are fully modulating (0-100%). The reheat output will modulate to maintain the space temperature at set point year-round
D. Air Conditioning Mode
    1. The return air temperature is above the room temperature setpoint
    2. The compressor starts, if not already operating in Dehumidification Mode
    3. Excess compressor hot gas is diverted to a fluid-cooled heat exchanger. Up to 100% of compressor heat is rejected into the glycol fluid loop which is pumped

outdoors to an outdoor air-cooled heat exchanger for 100% heat rejection at summer design ambient conditions
4. 100% of compressor heat is rejected at the outdoor air-cooled heat exchanger on a summer design day. On off-peak days, the air reheat output will modulate to maintain the space temperature at the set point
5. If the system cannot maintain the return air temperature setpoint, the second compressor will start

E. Space Heating Mode
1. The return air temperature is below the room temperature setpoint
2. The microprocessor space heating output signal (0-10 volts) is sent to the heating coil controller. The signal output will regulate based on the return air temperature

F. Pool Water Heating Mode
1. The return pool water temperature is below the pool water setpoint
2. If the compressor is already operating due to a Dehumidification or Air Conditioning demand, the control valves will divert the compressor hot gas through the coaxial heat exchanger to heat the pool water, with the remainder rejected at the air reheat coil or the AC heat exchanger
3. If there is no pre-existing demand for the compressor to operate, the microprocessor sends a signal to the auxiliary pool water heater (remote by others) to operate. The compressor will not operate solely for a pool water heating demand unless specifically configured to do so at the controller

G. Purge Mode
1. This mode is manually triggered by an operator when super-chlorinating the pool. It can be triggered at the unit-mounted or optional remote operator panel(s), through the online WebSentry interface or by the BACnet controller
2. Purge Mode has an adjustable timed duration after which the system automatically resumes normal operation
3. Once triggered by the operator:
    a. The compressor(s), if operating, pump down and cycle off
    b. A signal from the microprocessor sets the exhaust fan(s) to their maximum CFM
    c. The unit-mounted outdoor air dampers open fully and the return air dampers close
    d. The system stays in 100% outdoor air ventilation mode
    e. After the timed period expires, all dampers and fans return to normal operating settings and the system resumes normal operation
    f. During Purge Mode, the system will control heating based on supply air temperature

H. Economizer Cooling Mode
1. The return air temperature is above the room temperature setpoint
2. The microprocessor will compare the temperature of the outside air with the cooling setpoint
3. When outside air is deemed suitable by the microprocessor, it will be used as the first stage of sensible cooling
4. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space cooling demand

I. Economizer Dehumidification Mode
1. The return air relative humidity is above humidity setpoint
2. The microprocessor will compare the moisture content of the outside air to the dehumidification setpoint

3. When the outside air is deemed suitable by the microprocessor, it will be used as the first stage of dehumidification
4. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space humidity demand.

J. Freeze Protection
1. The supply air temperature falls below the freezestat setpoint or the optional freezestat sensor indicates a freezestat condition
2. Exhaust fan(s) are stopped and outdoor air damper(s) are fully closed
3. When the freezestat alarm is tripped, it must be manually cleared by the operator

3. **Cabinet**

A. The system shall be designed and configured for indoor installation with a 2" double-walled cabinet including painted inner liner
1. Infill panels and doors shall be constructed with 18 gauge G90 galvanized steel exterior and 18 gauge mil aluminum finish interior suitable for chlorine and pool chemical resistance.
2. The structural base frame shall be 3/16" steel channel base with 12-gauge steel cross bracing.

B. Cabinet Construction: All cabinet 16, 20 and 24 gauge sheet metal shall be galvanized G90 steel or GalvalumeTM alloy with mill-applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and rigidity. All seams shall be caulked with silicone to prevent air and water leakage or infiltration
1. Base Rails: The cabinet shall have a base frame comprised of 2 layers of 10 gauge mill galvanized G90 steel. Lifting lugs shall be provided on the base frame for rigging the system
2. The cabinet walls shall be of double-wall construction using 20 gauge pre-painted steel with a fully painted inner metal liner and 2 inches of fiberglass insulation
3. The cabinet floor shall be comprised of a 16-gauge galvanized steel panel with a 20-gauge pre-painted steel inner liner, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base frame of the unit
4. The cabinet roof shall be 20-gauge pre-painted steel, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base walls of the unit
5. The cabinets shall be mechanically assembled with stainless steel 5/32" sealed blind rivets. Where bolts are required bright zinc plated bolts shall be used
6. Access doors shall be supported on multiple hinges, held shut by compression latches for quick access. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Full height access doors shall have "hold back" latches to prevent door closure during the performance of service procedures
7. Access doors shall be mounted on multiple combination hinge/latch mechanisms which swing either direction 180 degrees and lifts off. Doors shall be provided for entrane to all sections housing components requiring routine maintenance. Doors shall be secured with minimum two tool-operated latches and sealed against the frame with rubber gasket material.
8. The system shall have non-corroding protective mesh screens covering internal fan blades, protective grates covering all floor access ports

C. Outdoor Air Intake:
1. Purge /Economizer and Minimum Outdoor Air connections with motorized dampers and controls.

D. Insulation: The unit shall be insulated per the following standards:
    1. All exterior cabinet sections shall be insulated with two (2) inch thick fiberglass inside the double walled cabinet
    2. Fire resistant rating to conform to NFPA Standard 90A and 90B
    3. Sound attenuation coefficient shall not be less than 1.02 at a frequency of 1,000 Hz as per ASTM Standard C423
    4. Thermal conductivity shall not exceed 0.26 Btu/in-h-sqft-F at 75 °F
E. Cabinet configuration shall include:
    1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams
    2. Unit shall be equipped with a second outdoor air intake assembly with motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper for Purge and Economizer operation
    3. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow
    4. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel

4. **Filters**

Wherever possible, air filters shall be standard sized, replaceable, off-the-shelf filters including:

A. Return Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure on a face loading rack
    1. Supply Air: 2-inch MERV 8, 30% pleated filters with rust-free non-metallic structure on face loading rack.
B. Outside Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure
    1. Outside Air: Washable, aluminum media type with aluminum U-channel frame wrapped around the perimeter of crimped layers of aluminum media. The frame is designed with drain holes to ensure removal of excess water.

5. **Coils**
A. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity
    1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
    2. Coil shall have galvanized casing and end plates
    3. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.
B. Air reheat coils shall be sized for variable heat transfer into the air with a capacity of 100% of the compressors total required heat of rejection
    1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
    2. Coil shall have galvanized casing and end plates
    3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer
C. Coils shall have an 8-year warranty extension for a total of 10 years coverage

6. **Drain Pans**

Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention

7. **Blowers and Blower Motors**
   A. Supply blowers:
      1. The multiple direct driven supply air blower wheels shall be a parallel mounted array. Blowers shall be a single width/single inlet airfoil plenum type, secured a machined, ground and polished solid steel shaft. The wheel shall be G90 galvanized steel with baked powder paint coating. The shaft shall be coated with a rust inhibitor
      2. The complete blower assembly shall be statically and dynamically balanced on precision electronic balancers
      3. The blower assembly shall be mounted on a 1" deflection spring isolated rack
      4. The fan inlets shall be equipped with accidental contact protection screen
      5. Motor(s) shall be Premium efficiency painted cast iron construction TEFC, NEMA MG1-PART 31 Inverter Duty 15:1 Constant Torque Severe Duty with a service factor 1.25. Motors shall be 6 Pole 1200 RPM synchronous speed with HOA switch with motor safeties against overloading at 60 Hz operation directly on mains. Motors shall have double lip seals on both ends with re-greasable bearings 254T frame and larger with Polyurea grease
      6. At least one motor shall be provided with a low motor noise and high starting torque VFD for air balancing purposes. The VFD shall have a drive efficiency of 96 to 98% with displacement power factor of 0.98, output maximum frequency of 400 Hz with torque boost. The VFD shall have protective features including: torque limit, heat sink over-temperature, current-limiting DC bus fuse, electronic motor overload with phase-to-phase and ground fault short circuit protection; current limit, over/under torque protection, over/under voltage protection, short circuit current rating of 30kA rms symmetrical and 100kA rms symmetrical
   B. Exhaust blowers:
      1. The packaged exhaust blower (EF1) shall be sized to maintain the negative pressure requirement in the space during normal operation and its operation tied to the systems occupancy scheduler
      2. The blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free a direct drive via a direct current (DC) electronic commuted (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the unit?s controller
      3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dymanic on two levels
      4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
      5. Thermal contacts installed in the windings compliant with THCL 155
      6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
      7. High corrosion resistance design with high quality and reliability
      8. The exhaust fan shall be controlled from an end switch on the power open of the exhaust air damper
   C. Purge blowers:
      1. The ventilation/economizer/purge exhaust blower (PEA) shall be unit mounted and sized to provide full exhaust from the space when operating with EF1

2. The fan shall be direct driven axial fan made of high-strength composite material in which the motor and controller are integrated. It includes FE2owlet blades combined with guide vanes and EC commutated direct-current external rotor motors provides maximum efficiency the quietest performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly. The fan is aerodynamically-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimized operation
3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels
4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
5. Thermal contacts installed in the windings compliant with THCL 155
6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
7. High corrosion resistance design with high quality and reliability
8. The exhaust fan shall be controlled from an end switch on the power open and spring return outside air damper

8. **Dampers**

Internal dampers shall be made from extruded anodized aluminum with a parallel blade configuration and neoprene double-seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

A. The system shall be provided with normally closed outside air and exhaust air dampers equipped with spring-return actuators The dampers adjust between 0% to 100% open position.
B. The outdoor air and exhaust air dampers shall be of opposed blade configuration. Dampers shall have 0.750-inch insulated blades made from extruded anodized aluminum with neoprene double-seal tips to minimize leakage. Damper leakage shall be less than 1% of maximum flow at 4-inch water column differential. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

9. **Pool Water Heater**

Coaxial heat exchanger with corrosion-resistant cupro-nickel water circuit tubing

A. Coaxial heat exchanger with corrosion-resistant cupro-nickel water circuit tubing
B. Self-purging and self-draining counter flow design
C. Water circuit piping shall consist of transparent braided PVC hose
D. Terminating connections are PVC schedule 40 NPT fittings located at the cabinet wall for easy connection
E. The maximum loop operating pressure is 60 psig

10. **Compressors**
A. Hermetic, scroll action compressor, suction gas cooled, suitable for refrigerant R-410A
B. The compressor(s) shall be mounted on rubber-in-shear isolators to limit the transmission of noise and vibration
C. The compressor(s) shall be equipped with removable crankcase heater(s) for liquid migration protection

D. The compressor(s) shall be located outside the conditioned air stream in the systems service vestibule
E. Compressors shall have a 3-year warranty extension for a total of 5 years coverage
F. The compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city

11. **Refrigeration Circuit**
    A. The system shall consist of two factory sealed refrigeration circuits for dehumidification and sensible cooling. No site refrigeration work shall be required
    B. Each refrigeration circuit shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need for service manifold gauges
    C. All refrigeration circuits shall have solenoid control valves, check valves, a liquid line filter-drier, liquid and moisture indicator, thermostatic expansion valve and a pump down solenoid valve
    D. The system shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head
    E. Tamper proof, hermetically sealed non-adjustable high and low pressure switches and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream
    F. The receiver shall have two refrigerant level (maximum and minimum) indicating sight glasses
    G. The suction line shall be fully insulated with 0.500-inch closed cell insulation
12. **Control Panel**
    A. The electrical contractor shall be responsible for external power wiring and disconnect switch fusing. Power block terminals shall be provided
    B. The system shall include a factory-installed non-fused disconnect
    C. Shall be mounted inside the service vestibule outside of the process air stream
    D. Blower motors shall be protected with thermal trip overloads
    E. The system shall have a voltage monitor with phase protection
    F. Available dry contacts shall include:
        1. Alarm
        2. Blower interlock
        3. Stage 1 & 2 heating
        4. Outdoor air damper control
        5. Remote exhaust fan #1
        6. Remote exhaust fan #2
        7. Outdoor-air cooled equipment
        8. System on
        9. Auxiliary pool heater 1
        10. Heat recovery
    G. Terminals shall be provided to send 24-volt power to the outdoor air cooled condenser or fluid cooler fan contactor
    H. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with the NFPA All components used in the system shall be UL or CSA listed
    I. Wiring diagrams shall be located near the electrical panel(s) on the system. These diagrams shall provide colour-coding and wire numbering for easy troubleshooting. All wires shall be contained in a wire duct.
    J. The compressor(s) shall have a time delay on start to prevent short cycling
    K. Pressure transducers for measuring refrigerant discharge (high) pressure and suction (low) pressure shall be provided.
    L. An airflow switch and a dry contact for alarm(s) shall be provided

13. **Microprocessor Control**
    A. A microprocessor controller with the following characteristics will be provided:
        1. All set points and parameter adjustments are pre-programmed at the factory during quality control testing
        2. The microprocessor program shall be stored on updatable FLASH memory
        3. A minimum of 11 analogue inputs, 4 analogue outputs, 24 digital inputs and 16 digital outputs
        4. Four serial interface ports including both RS232 and RS485 types
        5. An Ethernet port with RJ-45 connector and LED activity indicator
        6. A real time clock to time-stamp the system operation log and to enable a programmable 7-day occupation schedule
        7. Two manual demand forced modes to allow the user to manually bypass the microprocessor in the event of controller failure
        8. The local and remote operator panel(s) shall have a backlit graphic liquid crystal display with touch controls
    B. The system shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges.
    C. The following status LEDs shall be on the controller:
        1. Alarm - indicates there has been a failure requiring service.
        2. Dehumidification - indicates that the system is dehumidifying the space.
        3. Cooling - indicates that the air-conditioning mode.
        4. Pool Heating - indicates that the system is heating the pool water with recycled energy.
        5. Space Heat - indicates that the space heating is operating.
        6. Maintenance - indicates whether or not maintenance is required.
        7. Manual - indicates that the system has been set to manual operation.
    D. The following set points shall be accessible and adjustable from the operator panel:
        1. Space temperature
        2. Space relative humidity
        3. Pool water temperature
    E. The following sensors shall be unit-mounted and monitored at the operator panel. All information from these items shall be actively used in the system control and operation strategies:
        1. Refrigerant high pressure
        2. Refrigerant low pressure
        3. Return air temperature
        4. Supply air temperature
        5. Return air relative humidity
        6. Entering pool water temperature
        7. Leaving pool water temperature
        8. Evaporator leaving air temperature
        9. Suction temperature
        10. Discharge temperature
    F. System Fault: Shall indicate via text message to the display what systems require attention or servicing. Built-in monitoring and diagnostics shall allow the user to view the following:
        1. Power failure
        2. Dirty air filter
        3. Refrigerant high and low pressure
        4. System off
        5. Anti-short cycle delay

14. **Air Heating**

The packaged indirect-fired natural gas duct furnace module shall be sized to meet the scheduled heating capacity and have the following characteristics:

A. Modulating (0-10V) auxiliary air heat control
B. The duct furnace module shall be a natural gas indirect-fired type using spark ignition with a heating capacity as shown in this submittal and is installed in a 'blow through' configuration downstream from the blower. The heat exchanger tubes are constructed of formed and welded 16-gauge series 409 stainless steel suitable for installation downstream of the cooling coil and satisfactory for air inlet temperatures below 40 °F. The burner is the power firing type and incorporates a primary combustion air blower and spark ignition transformer
C. The duct furnace module shall be a propane gas indirect-fired type using spark ignition with a heating capacity as shown in this submittal and is installed in a 'blow through' configuration downstream from the blower. The heat exchanger tubes are constructed of formed and welded 16-gauge series 409 stainless steel suitable for installation downstream of the cooling coil and satisfactory for air inlet temperatures below 40 °F. The burner is the power firing type and incorporates a primary combustion air blower and spark ignition transformer
D. Standard controls shall include a modulating gas valve, intermittent spark ignition, overheat control, rollout flame supervision, combustion air flow proving switch, positive burner safety switch, pilot cock, main gas cock with 100% shut off, adjustable main and pilot pressure regulators
E. The natural gas duct furnace module shall be an ETL recognized component. The gas train shall be complete with all controls factory mounted to comply with requirements of ETL. The gas train is complete with a modulating main gas valve and is ready for connection to a natural gas supply with pressure between 7 in and 14 in WC
F. The liquid propane duct furnace module shall be an ETL recognized component. The gas train shall be complete with all controls factory mounted to comply with requirements of ETL. The gas train is complete with a modulating main gas valve and is ready for connection to a propane gas supply with pressure between 7 in and 14 in WC
G. The complete system shall be test-fired and preliminary adjustments made prior to leaving the factory

15. **Air Conditioning**

Air-cooled air conditioning via a fluid cooler

A. The system shall be equipped with an air conditioning mode where excess compressor heat is rejected to a remote outdoor air-cooled heat exchanger (aka Dry Cooler) via a single glycol fluid loop. No site refrigeration work shall be required. The system shall include a circulating pump and expansion tank. The packaged fluid cooled condenser and remote outdoor air-cooled heat exchanger shall both be capable of rejecting 100% of the compressor heat rejection with an air on temperature at summer design conditions
B. The system shall be provided with a dry contact rated for 24VAC/5A to operate the remote outdoor fluid cooler control
C. Each refrigeration circuit shall include refrigerant valves, a receiver with pressure relief valve set at 650 psig, a pressure control valve and a pressure differential valve, and two manual shutoff valves to isolate the outdoor fluid cooler
D. Coils shall be tested at 425 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow and have adequate capacity to dissipate the total heat rejection of the system at design conditions

E. The fan(s) shall be direct driven axial fan(s) with dual speed external rotor motor(s) and innovative bionic blades in die-cast aluminum moulds
    1. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels
    2. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
    3. Thermal contacts installed in the windings compliant with THCL 155
    4. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
    5. High corrosion resistance design with high quality and reliability

16. **Factory Performance Testing**
    A. A. The system shall be thoroughly tested under factory test conditions. A copy of the original test report shall be available to the engineer upon request
    B. Microprocessor controls shall be factory adjusted and pre-set to the design conditions during testing

Part 3 - Execution

1. **Product Delivery, Acceptance, Storage and Handling**
    A. Perform a thorough physical inspection of the system upon delivery from the shipment carrier
    B. Identify and immediately report any physical damage to manufacturer
    C. If the system is to be stored prior to installation, store in a clean, dry place protected from weather, dirt, fumes, water, construction and physical damage
    D. Handle the system carefully during installation to prevent damage
    E. Damaged systems or components shall not be installed. Contact the manufacturer for RMA instructions
    F. Comply with the manufacturer's rigging and installation instructions for unloading the system and moving it into position
2. **Connections**
    A. Where installing piping adjacent to the system, allow space for service and maintenance
    B. Duct connections: drawings indicate the general arrangements of the ducts. Connect the system to ducts with flexible duct connectors. Comply with code requirements for flexible duct connectors
    C. Electrical connections: comply with code requirements for power wiring, switches and motor controls in electrical sections
3. **Installation**
    A. Installation shall be completed by a license qualified installing mechanical contractor.
    B. Owner recommendations will be considered when qualifying mechanical contractor.
4. **Factory Start Up**
    A. Equipment Startup: A factory direct technician shall be onsite to complete factory startup and complete factory startup reports.
    B. BACnet Startup: Manufacturer Representative technician shall be onsite to complete BACnet Startup with BAS contractor.
    C. Detailed instructions for startup as provided by the manufacturer must be followed
    D. Installing contractor must contact the manufacturer prior to start up to confirm start up procedures
    E. Remote Internet access and control must be initiated and confirmed by the factory prior to start up for extended labor warranty to be in effect.
5. **SERVICE AGREEMENT**
    A. Engage a factory-authorized service representative to perform maintenance as specified.
    B. Service Agreement shall be for one (1) years with four (4) visits per year:

1. Two (2) Quarterly Visits Consisting of
2. Report in with the Customer Representative.
3. Review customer logs with the customer for operational problems and trends.
4. Inspect and clean drain pans.
5. Tighten electrical connections if required.
6. Check and tighten, if requires, pool water hose clamps and sensor mounts
7. Inspect coils for dirt build-up.
8. Check that the P-trap is primed (filled with water). It is good practice to pour some water into the drain pan to ensure that the P-trap is primed and operational
9. Check and lubricate motor bearings. Refer to the motor manufacturer's instructions.
10. Check outdoor air louvres for accumulation of dust and clean as required.
11. Verify that all set-points are correctly programmed as specified by the facility operator.
12. Record and report abnormal conditions, measurements taken, etc.

C. Two (2) Semi Annual Visit Consisting of
1. Report in with the Customer Representative.
2. Review customer logs with the customer for operational problems and trends.
3. Inspect the unit casing for corrosion. If damage is found, clean and repaint the affected surface with a rust-resistant primer.
4. Clean the fan wheel(s) and motor shaft(s).
5. Inspect and clean drain pans.
6. Check damper operation.
7. Inspect electrical components, wiring and insulation.
8. Rotate the fan wheel(s) and check for obstructions and rubbing.
9. Lubricate motors as directed by motor manufacturer.
10. Check gasket condition on all doors to ensure an airtight seal.
11. Check for loose external or internal parts, paying careful attention external components.
12. Check bolts on compressors, motor mounts, unit bases and coils and tighten if required.
13. Verify that the airflow around the remote condenser or dry cooler is unobstructed.
14. Wash and clean evaporator coils.
15. Clean, Inspect and Operate Gas heaters
16. Wash and clean fluid cooler coils.
17. Record and report abnormal conditions, measurements taken, etc.

6. **Owner Training**
A. Manufacturer Representative technician shall be onsite to train owner’s maintenance personnel to operate and maintain dehumidification unit.
B. Two (2) separate Eight (8.0) Hr trainings shall be provided.
1. 1st Training- During typical training cycle for new building systems.
2. 2nd Training- At first filter change by owner.

Section 15738A – Split System Air Handling Units

Part 1 - General

1.01 Related Documents

1.02 General Description

A. This section includes the design, controls, and installation requirements for indoor air handling units.

1.03 Quality Assurance

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. Unit Seasonal Energy Efficiency Ratio (SEER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

1.04 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided. Run test report shall be supplied with the unit in the control compartment's literature packet, and also available electronically after the unit ships.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, clearances, and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with detail for power and control systems and differentiate between factory installed and field installed wiring.

1.05 Delivery, Storage, and Handling

A. Unit shall be on a wooden pallet with skeleton crating prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be handled carefully to avoid damage to components, enclosures and finish.

D. Unit shall be stored in a clean, dry place protected from weather and construction traffic in accordance with Installation, Operation and Maintenance manual instructions.

1.06 Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment start up or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Trane
3. YORK, JCI
4. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. ECM driven direct drive backward curved plenum supply fans
   c. Double wall cabinet construction
   d. Insulation with a minimum R-value of 6.25
   e. Double-sloped stainless steel drain pans
   f. Hinged access doors with lockable handles
   g. LED service lights in the control panel
   h. Designed, engineered, and manufactured in the United States of America
   i. All other provisions of the specifications must be satisfactorily addressed

2.02 Air Handling Units

A. General Description

1. Indoor air handling units shall include filters, supply fans, DX evaporator coil, reheat coil, electric heaters, mixing box, and unit controls.
2. Unit shall have a draw-through supply fan configuration and discharge air horizontally.
3. Unit shall be factory assembled and tested including leak testing of the coils and run testing of the supply fans and factory wired system. Run test report shall be supplied with the unit in the control compartment’s literature packet, and also available electronically after the unit ships.

4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

5. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.

6. Installation, Operation and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Access doors shall be flush mounted to cabinetry.

6. Units with a cooling coil shall include double-sloped 304 stainless steel drain pan. Drain pan connection shall be on the right hand side of unit with a 1" MPT fitting.

7. Cooling coil shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

8. Unit shall include factory wired control panel compartment LED service lights.

9. Unit shall include interior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure. Interior ceiling, floor, service doors, damper rack, and filter rack in the air stream shall be coated. The coils, coil casings, condensate drain pans, damper blades and gears, fan inlet cone, fan wheel, fan motor, control panel, and energy recovery wheel casing shall not be coated. Option is intended for use in coastal saltwater conditions under the stress of heat, salt, sand and wind and is applicable to all corrosive environments where a polyurethane coating is acceptable.

10. Unit shall include exterior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

C. Electrical

1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Both side walls of the control panel shall include louvered vents. Control panel shall be field mounted and shall include a piano hinged service access door with tooled entry.

2. Unit shall be provided with standard power block for connecting power to the unit.

3. Unit shall include a factory installed 24V control circuit transformer.

4. Unit shall have a 5kAIC SCCR.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

2. Blower and motor assembly shall be dynamically balanced.

3. Motor shall be a high efficiency electronically commutated motor (ECM).

4. Blower and motor assembly shall utilize neoprene gasket.

5. ECM driven supply fan speed shall be controlled with the factory installed AAON controller.

6. Access to supply fan shall be through an access door with removable pin hinges and lockable quarter turn handles.

E. Cooling Coil

1. Access to cooling coil shall be through hinged access door with lockable quarter turn handles.

2. Access to reheat coil shall be through hinged access door with lockable quarter turn handles.

3. Evaporator Coil

a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

b. Coil shall be 6 row high capacity and 12 fins per inch.

c. Coil shall be hydrogen leak tested.

d. Coil shall be furnished with factory installed thermostatic expansion valves. The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.

e. Coil shall have right hand external piping connections. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing, and be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

f. Coil shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. The coating process will ensure complete coil encapsulation and a uniform dry film thickness from 0.6 – 1.2 mils on all surface areas (including fin edges) and meet 5B rating cross-hatch adhesion per ASTM B3359. Humidity and water immersion resistance shall be up to a minimum 1,000 and 1,000 hours respectively (ASTM D2247 and ASTM D870). Corrosion durability shall be confirmed through testing to no less than 10,000 hours salt spray per ASTM B117. Coated coil shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

F. Refrigeration System

1. Air handling unit and matching condensing unit shall be capable of operation as an R-410A split system air conditioner.

2. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.

3. Modulating hot gas reheat shall be provided on the refrigeration circuit. Air handling unit shall be provided with hot gas reheat coil, a check valve on the liquid line, and a check valve on the hot gas reheat line. The matching condensing unit must include modulating 3-way reheat valve, liquid line receiver, electronic controller, supply air temperature sensor and a dehumidification control signal terminal.This allows the system to have a dehumidification mode of operation and includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. Reheat line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

4. The refrigerant circuit shall be provided with external hot gas bypass to protect against evaporator frosting at low suction pressure and to prevent excessive compressor cycling. Hot gas bypass valve shall be factory installed in the matching AAON condensing unit. Hot gas bypass line connection shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

G. Electric Heating

1. Unit shall include an electric heater consisting of electric heating coils, fuses, contactors, and a high temperature limit switch, with capacities as shown on the plans.

2. Unit shall include 2 stages of capacity control.

3. Electric heating coils shall be located in the reheat position downstream of the supply fan.

H. Filters

1. Unit filter access shall be through service access door with piano hinges and quarter turn button fasteners.

2. Unit shall include 2 inch thick, pleated panel filters with MERV rating of 8, upstream of the cooling coil.

I. Mixing Box

1. Unit shall contain a mixing box with front return air opening and top outside air opening.

2. Return air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a 2 position actuator.

3. Outside air opening shall contain an adjustable, motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Dampers shall be controlled by a 2 position actuator.

J. Controls

1. Unit shall be provided with a proof of airflow switch. When airflow is not detected, the supply fans will shut down.

2. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.

3. Access to external control panel shall be through hinged access door with tooled entry.

4. Factory Installed and Factory Provided Controller

a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.

b. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

d. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

e. Constant Volume Controller

1. Unit shall modulate cooling with constant airflow to meet space temperature cooling loads.

2. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Staged heating capacity shall modulate based on space temperature.

f. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a BACnet network.

Part 3 - Execution

3.01 3.01 Installation, Start Up, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Factory Authorized Representative shall provide on-site Start Up of the rooftop package unit and associated controls. A startup report shall be provided detailing the completion of work and initial settings. Startup and startup report to the owner shall include the following items.

i. Electrical Power

ii. Supply Fans

iii. Dampers

iv. Heater

D. Installing Contractor will schedule start up appointment with Factory Authorized Representative.

E. Factory Authorized Representative shall be located within 50 miles of jobsite.

F. Factory Authorized Service Technician shall be located within 30 miles of jobsite.

3.02 SERVICE AGREEMENT

A. Engage a factory-authorized service representative to perform maintenance as specified.

B. Service Agreement shall be for one (1) years with four (4) visits per year:

i. Two (2) Quarterly Visits Consisting of

1. Report in with the Customer Representative.

2. Review customer logs with the customer for operational problems and trends.

3. Inspect and clean drain pans.

4. Tighten electrical connections if required.

5. Inspect coils for dirt build-up.

6. Check that the P-trap is primed (filled with water). It is good practice to pour some water into the drain pan to ensure that the P-trap is primed and operational

7. Check and lubricate motor bearings. Refer to the motor manufacturer's instructions.

8. Verify that all set-points are correctly programmed as specified by the facility operator.

9. Record and report abnormal conditions, measurements taken, etc.

ii. Two (2) Semi Annual Visit Consisting of

1. Report in with the Customer Representative.

2. Review customer logs with the customer for operational problems and trends.

3. Inspect the unit casing for corrosion. If damage is found, clean and repaint the affected surface with a rust-resistant primer.

4. Clean the fan wheel(s) and motor shaft(s).

5. Inspect and clean drain pans.

6. Check damper operation.

7. Inspect electrical components, wiring and insulation.

8. Rotate the fan wheel(s) and check for obstructions and rubbing.

9. Lubricate motors as directed by motor manufacturer.

10. Check gasket condition on all doors to ensure an airtight seal.

11. Check for loose external or internal parts, paying careful attention external components.

12. Wash and clean evaporator coils.

13. Clean electric heater coils.

14. Record and report abnormal conditions, measurements taken, etc.

3.03 Training

Factory Authorized Representative shall provide on-site training to the owner. Training shall cover operation and maintenance of the package unit and all factory provide control items. The owner shall schedule the time and date directly with the Factory Authorized Representative.

Section 15738B – Split System Condensing Units

Part 1 – General

Related Documents

General Description

A. This section includes the design, controls and installation requirements for air-cooled condensers / condensing units.

Quality Assurance

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. System Seasonal Energy Efficiency Ratio (SEER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

Delivery, Storage, and Handling

A. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

B. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts

associated with routine maintenance and refrigerant.

B. With a residential CB and F1 or CB and AU matched split system, manufacturer's warranty shall be for a period of 5 (10) years. Warranty shall begin on the date of the original installation, or three months after date of original shipment from the factory (as shown on the warranty certificate), whichever occurs first. The warranty shall cover material and workmanship that prove defective within the above period, under normal use and maintenance. Refer to the Limited Warranty Certificate

C. Compressors shall carry a 5 year non-prorated warranty, from date of original equipment shipment, from the factory.

Part 2 - Products

Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Trane
3. YORK, JCI
4. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Two-stage compressors with capacities of 100% and 67%
   c. Variable capacity compressor with 10-100% capacity
   d. 2,500 hour salt spray tested exterior corrosion protection
   e. Designed, engineered, and manufactured in the United States of America
   f. All other provisions of the specifications must be satisfactorily addressed

Condensing Units

A. General Description

1. Condensing unit shall include compressors, air-cooled condenser coils, condenser fans, suction and liquid connection valves, and a control panel.
2. Unit shall be factory assembled and tested including leak testing of the coil and run testing of the completed unit. Run test report shall be supplied with the unit.
3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
4. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
5. Installation, Operation and Maintenance manual shall be supplied within the unit.

6. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access panel.

7. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access panel.

B. Construction

1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.

2. Unit shall be specifically designed for outdoor application.

3. The condenser coil shall be mechanically protected from physical damage by painted G90 galvanized steel louvers covering the full area of the coil.

4. Access to electrical and controls components shall be a tooled access panel.

5. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

C. Electrical

1. Unit shall be provided with fan motor and compressor contactors, 5 minute off compressor time delay relay, and standard power block for connecting power to the unit.

2. Unit shall have a 5kAIC SCCR.

3. Supply air sensor for modulating hot gas reheat control will ship in the air handling unit with the unit controls to be field installed in the air handling unit supply air stream.

4. Modulating hot gas reheat shall be factory wired with a priority of cooling. If a call for cooling and dehumidification occur simultaneously, the unit will run in cooling mode until the cooling setpoint temperature is satisfied. If dehumidification is still required, the compressors will continue to run and hot gas reheat will be activated.

5. Modulating hot gas reheat shall be factory wired with a priority of dehumidification. If a call for cooling and dehumidification occur simultaneously, the unit will run in dehumidification mode until the humidity setpoint is satisfied.

D. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant and oil.

2. Unit shall include a variable capacity scroll compressor which shall be capable of modulation from 10-100% of its capacity.

3. Each compressor shall be furnished with a crankcase heater.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high

pressure and low pressure sides, 3-way modulating hot gas reheat valve and controller, liquid line receiver, and service valves for liquid, hot gas reheat, and suction connections. Liquid line filter driers shall be factory provided and field installed. Field provided and installed refrigerant circuits shall include the low side cooling components, hot gas reheat coil, thermal expansion valve (in AHU), liquid line, insulated hot gas reheat line, and insulated suction line. The hot gas reheat line must include a purge circuit.

6. Unit shall include a factory holding charge of R-410A refrigerant and oil.

7. The compressor shall be covered by a high-density foam sound attenuating blanket to reduce radiated noise.

8. Refrigeration circuit shall be provided with hot gas reheat coil in the matching air handler, modulating valve, electronic controller, supply air temperature sensor and a dehumidification control signal terminal that enables the dehumidification mode of operation, and includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. The matching indoor air handler must include a hot gas reheat coil.

9. Condenser fans shall be high efficiency electronically commutated motor driven with factory installed head pressure control module and discharge pressure sensor. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

10. Unit shall be provided with a suction pressure transducer on the refrigeration circuit.

Condensers

A. Air-Cooled Condenser

1. Condenser fan shall be vertical discharge, axial flow, direct drive fans.

2. Condenser fans shall be high efficiency electronically commutated motor driven with two speeds which are controlled by the compressor enable signals. ECM condenser fan motor shall be weather protected, single phase, and direct drive with inherent overload protection.

3. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled. **MICROCHANNEL NOT ACCEPTABLE.**

4. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

5. Coils shall be hydrogen leak tested.

6. Coil shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. The coating process will ensure complete coil encapsulation and a uniform dry film thickness from 0.6 – 1.2 mils on all surface areas (including fin edges) and meet 5B rating cross-hatch adhesion per ASTM B3359. Humidity and water immersion resistance shall be up to a minimum 1,000 and 1,000 hours respectively (ASTM D2247 and ASTM D870). Corrosion durability shall be confirmed through testing to no less than 10,000 hours salt spray per ASTM B117. Coated coil shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

Controls

A. Standard Terminal Block

1. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage provided to the unit.

2. Unit shall include factory installed AAON Orion RSMSD board. The matching air handling unit must include AAON Orion VCC-X2 controls. A shielded pair must be field provided and installed between the condensing unit and air handling unit. An optional additional shielded pair can be installed if interface communication is desired.

Part 3 - Execution

3.01 3.01 Installation, Start Up, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Factory Authorized Representative shall provide on-site Start Up of the rooftop package unit and associated controls. A startup report shall be provided detailing the completion of work and initial settings. Startup and startup report to the owner shall include the following items.

i. Electrical Power

ii. Condenser Fans

iii. Compressors

D. Installing Contractor will schedule start up appointment with Factory Authorized Representative.

E. Factory Authorized Representative shall be located within 50 miles of jobsite.

F. Factory Authorized Service Technician shall be located within 30 miles of jobsite.

3.02 SERVICE AGREEMENT

A. Engage a factory-authorized service representative to perform maintenance as specified.

B. Service Agreement shall be for one (1) years with four (4) visits per year:

i. Two (2) Quarterly Visits Consisting of

1. Report in with the Customer Representative.

2. Review customer logs with the customer for operational problems and trends.

3. Tighten electrical connections if required.

4. Inspect coils for dirt build-up.

5. Check and lubricate motor bearings. Refer to the motor manufacturer's instructions.

6. Check outdoor air louvres for accumulation of dust and clean as required.

7. Verify that all set-points are correctly programmed as specified by the facility operator.

8. Record and report abnormal conditions, measurements taken, etc.

ii. Two (2) Semi Annual Visit Consisting of

1. Report in with the Customer Representative.

2. Review customer logs with the customer for operational problems and trends.

3. Inspect the unit casing for corrosion. If damage is found, clean and repaint the affected surface with a rust-resistant primer.

4. Clean the fan(s) and motor shaft(s).

5. Inspect and clean drain pans.

6. Check damper operation.

7. Inspect electrical components, wiring and insulation.

8. Rotate the fan (s) and check for obstructions and rubbing.

9. Lubricate motors as directed by motor manufacturer.

10. Check gasket condition on all doors to ensure an airtight seal.

11. Check for loose external or internal parts, paying careful attention external components.

12. Check bolts on compressors, motor mounts, unit bases and coils and tighten if required.

13. Verify that the airflow around the condenser.

14. Wash and clean condenser coils.

15. Record and report abnormal conditions, measurements taken, etc.

3.03 Training

A. Factory Authorized Representative shall provide on-site training to the owner. Training shall cover operation and maintenance of the package unit and all factory provide control items. The owner shall schedule the time and date directly with the Factory Authorized Representative.

B. Two (2) separate Eight (8.0) Hr trainings shall be provided.

   i. 1st Training- During typical training cycle for new building systems.

   ii. 2nd Training- At first filter change by owner.

SECTION 15815 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal Ductwork.
2. Nonmetal ductwork.
3. Casing and plenums.
4. Kitchen hood ductwork.
5. Dishwasher exhaust ductwork.
6. Hangers and supports.

B. References:

1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.
2. ASTM A 366/A 366M - Standard Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold Rolled; 1997.
3. ASTM A 569/A 569M - Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial; 1998.
4. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1998.
5. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 1996.
6. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 1996.
7. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 1994.
8. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; latest Edition.
9. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 1996.

1.3 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", latest edition and NFPA 90A.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Duct Construction Standards (DCS) for each pressure class required for this project. DCS shall include transverse and longitudinal joint type, any internal or external reinforcement and sheetmetal thickness and size for each pressure class.
4. Flexible duct manufacturer, type and product details.
5. Flexible connection materials and connection types.
6. Fitting fabrication details.
7. Damper details.
8. Description of hanger types and sizes for duct sizes used in this project. Hangers must comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible". Hanger submittal should include hanger spacing to be used.

B. Coordination Drawings: Provide drawings indicating fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work. Minimum scale of ¼" = 1'0". Coordinate duct location with other trades.

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Where space constraints will not allow a centerline radius of 1.0 times the width of duct, provide rectangular elbows with double wall (airfoil) factory fabricated turning vanes installed on vane runner rails. Turning vanes shall not be used in bends other than 90 degrees.

1. Branch connections shall be 45 degree entry fittings.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McGill AirFlow LLC.
2. SPOT
3. SEMCO

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated. If duct is exposed to the weather, provide a continuous sheetmetal hat channel over all transverse joints and position openings in longitudinal seams facing in the direction of possible water flow. Provide a flexible, adhesive aluminum jacket designed for this application over entire duct surface per manufacturer’s recommendations.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.
5. Insulation thickness to be 2 inches.

E. Inner Duct: Minimum 0.028-inch (0.7-mm) solid sheet steel.

2.3 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. SPOT

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 36 Inches (1524 mm) in Diameter: Flanged.

D. Longitudinal Seams: Round and flat oval duct must be spiral seam ductwork. Longitudinal seam snap-lock duct will not be allowed.

E. Tees, Laterals and Bends: Fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Elbows and bends: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Elbows shall be of gored, pleated or stamped construction. 90 degree bends shall be a minimum of 5-gore. 45 degree bends shall be a minimum of 3 gore. Adjustable elbows will not be allowed.

2. Branch connections shall be conical, 45 deg. entry or lateral fittings.

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lindab Inc.
2. McGill AirFlow LLC.
3. SEMCO Incorporated.
4. SPOT

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 36 Inches (1524 mm) in Diameter: Flanged.

2. Longitudinal Seams: Round and flat oval duct must be spiral seam ductwork. Longitudinal seam snap-lock duct will not be allowed.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Elbows and bends: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Elbows shall be of gored, pleated or stamped construction. 90 degree bends shall be a minimum of 5-gore. 45 degree bends shall be a minimum of 3 gore. Adjustable elbows will not be allowed.
    b. Branch connections shall be conical, 45 deg. entry or lateral fittings.

D. Inner Duct: Minimum 0.028-inch (0.7-mm) solid sheet steel.

E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: [0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K)] at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

2.5 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Tie Rods: Galvanized steel, 3/8-inch (10-mm) minimum diameter.

2.6 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.8 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.9 Insulated Flexible Ducts

2.10 Kitchen Exhaust Ducts

2.11 Dishwasher Exhaust Ducts

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 15 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet (6 m) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal all duct according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. All duct: Seal Class A.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg (750 Pa): Test representative duct sections, selected by Engineer from sections installed**,** totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel**.**

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive [1-inch wg (250 Pa)]
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 1-inch wg (500 Pa), or round up the ESP listed in the equipment schedules and provide, whichever is greater.
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Variable-Air-Volume Air-Handling Units prior to terminal units:

a. Pressure Class: Positive 3-inch wg (750 Pa)
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

C. Return, toilet exhaust and outside air ducts:

1. Pressure Class: Positive or negative 1-inch wg (250 Pa).
2. SMACNA Leakage Class for Rectangular: 12
3. SMACNA Leakage Class for Round and Flat Oval: 12

D. Special Exhaust Ducts:

1. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

    a. Exposed to View: Type 304, stainless-steel sheet.
    b. Concealed: Type 304, stainless-steel sheet.
    c. Welded seams and joints.
    d. Pressure Class: Positive or negative 4-inch wg (1000 Pa).
    e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
    f. SMACNA Leakage Class: 3.
    g. Minimum 18 gauge or thickness required per local code, whichever is greater

2. Ducts Connected to Dishwasher Hoods:

    a. Type 304, stainless-steel sheet.
    b. Welded seams and flanged joints with watertight EPDM gaskets.
    c. Pressure Class: Positive or negative 2-inch wg (500 Pa).
    d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
    e. SMACNA Leakage Class: 3.
    f. Minimum 18 gauge or thickness required per local code, whichever is greater

E. Duct Exposed to View

1. Supply Air Ducts: shall be double wall spiral round construction with 1” thick insulation in conditioned spaces and 2” insulation in unconditioned spaces.
2. Return and Exhaust Air Ducts: shall be un-insulated single wall spiral round construction in conditioned spaces and double wall round construction with 1” insulation in unconditioned spaces.

END OF SECTION 15815

SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Combination fire and smoke dampers.
7. Turning vanes.
8. Duct-mounting access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.
12. Louvers.

B. Related Sections include the following:

1. Division 13 Section "Fire Alarm" for duct-mounting fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Combination fire and smoke dampers.
7. Turning vanes.
8. Duct-mounting access doors.
9. Flexible connectors.
10. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Fire-damper, smoke-damper, and combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M.

D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063, temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 BACKDRAFT DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. Ruskin Company.

B. Description: Multiple-blade, parallel action gravity balanced, with blades of maximum 6-inch (150-mm) width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

C. Frame: 20 gauge, galvanized sheet steel, with welded corners and mounting flange.

D. Blades: 0.025-inch- thick, roll-formed aluminum.

E. Blade Seals: Vinyl.

F. Blade Axles: Stainless Steel.

G. Tie Bars and Brackets: Galvanized steel.

H. Basis of Design: Ruskin S3G.

2.4 VOLUME DAMPERS

A. Manufacturers:
1. Flexmaster U.S.A., Inc.
2. METALAIRE, Inc.
3. Nailor Industries Inc.
4. Ruskin Company.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed

position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 2-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 22 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Single Skin Steel Blades: 22 gauge, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Bearings: Molded synthetic.
5. Tie Bars and Brackets: Aluminum.
6. Tie Bars and Brackets: Galvanized steel.
7. Basis of Design: Ruskin MD 15 (rectangular) and MDRS25 (round).

D. Jackshaft: 1-inch- (25-mm-) diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 MOTORIZED CONTROL DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Description: AMCA-rated, parallel (return air applications) or opposed (outside air applications) blade design; minimum of 16 gauge thick, galvanized-steel frames with holes for duct mounting; minimum of 16 gauge thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).

1. Secure blades to 1/2-inch- (13-mm-) diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.

2. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
3. Provide closed-cell neoprene edging rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 1-inch wg; when tested according to AMCA 500D.

C. Basis of Design: Ruskin CD35.

2.6 FIRE DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours (3 hours as noed).

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 20 gauge galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 20 gauge frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: 24 gauge, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F rated.

J. Basis of Design: 1-1/2 hour – Ruskin 1BD2-B (rectangular) and FDR25 (round), 3 hour – Ruskin 1BD2-B3 (rectangular)

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. Nailor Industries Inc.
4. Ruskin Company.

B. General Description: Labeled according to UL 555S. Combination fire and smoke dampers shall be labeled according to UL 555 for 1-1/2-hour rating.

C. Fusible Links: Replaceable, 165 deg F rated.

D. Frame and Blades16 gauge, galvanized sheet steel.

E. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application.

F. Damper Motors: Modulating and two-position action.

1. Comply with requirements in Division 15 Section "Motors."
2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
4. Outdoor Motors and Motors in Outside-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
5. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
6. Electrical Connection: 115 V, single phase, 60 Hz.

G. Basis of Design: Ruskin FSD376.

2.8 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

1. Manufacturers:
   a. CESCO Products.

b. Flexmaster U.S.A., Inc.
c. Greenheck.
d. Nailor Industries Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

a. Less Than 12 Inches (300 mm) Square: Secure with two sash locks.
b. Up to 18 Inches (450 mm) Square: Two hinges and two sash locks.
c. Up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.
d. Sizes 24 by 48 Inches (600 by 1200 mm) and Larger: One additional hinge.

C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

D. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corp.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.11 INSULATED ACOUSTICAL MEDIUM PRESSURE FLEXIBLE DUCT

A. Where flexible duct is shown on drawings, provide Flexmaster Type 8M UL 181 Class I Air Duct or equal.

B. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.

C. The internal working pressure rating shall be at least 6" w.g. positive and 4" w.g. negative with a bursting pressure of at least 2 ½ time the working pressure

D. The duct shall be rated for a velocity of at lease 4000 feet per minute.

E. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

F. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

1. The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	7	31	40	38	40	27
8" diameter	13	29	36	35	38	22
12" diameter	21	28	29	33	26	12

2. The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	5	8	7	8	11	15
8" diameter	10	7	7	8	10	13
12" diameter	9	6	6	5	9	13

3. The self generated sound power levels (LW) dB re 10^{-12} Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	42	31	23	18	17	21
8" diameter	41	34	27	19	18	21
12" diameter	54	45	38	31	27	23

G. Factory insulate the flexible duct with fiberglass insulation. Provide insulation as required by ASHRAE 90.1.

H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM #96, Procedure A.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.13 LOUVERS

A. Manufacturers:
1. Ruskin
2. Greenheck

B. Description: Stationary-type louver with blades designed to prevent the penetration of wind driven rain.
1. Extended sill to drain water to building exterior.
2. Extruded aluminum alloy as follows:
   a. 5" deep frame with 0.081" wall thickness.
   b. Blades shall be double drainable and sight proof.
   c. Provide with aluminum screen.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

E. Provide test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

G. Install duct silencers independent of ducts with flexible duct connectors, lagged with loaded vinyl sheet on inlets and outlets where indicated.

H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers and equipment.
3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
5. On sides of ducts where adequate clearance is available.

I. Install the following sizes for duct-mounting, rectangular access doors:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body Plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Install the following sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 8 inches (200 mm) in diameter.

2. Two-Hand Access: 10 inches (250 mm) in diameter.
3. Head and Hand Access: 12 inches (300 mm) in diameter.
4. Head and Shoulders Access: 18 inches (460 mm) in diameter.
5. Body Access: 24 inches (600 mm) in diameter.

K. Label access doors according to Division 15 Section "Mechanical Identification."

L. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to low pressure ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 15820

SECTION 15838 - POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Utility set fans.
2. Centrifugal roof ventilators.
3. Ceiling-mounting ventilators.
4. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on sea-level conditions.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Show roof penetration requirements and reflected ceiling plans drawn to scale and coordinating roof penetrations and units mounted above ceiling. Show the following:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Utility Set Fans:
   a. Cook, Loren Company.
   b. Greenheek.
   c. Penn Ventilation Companies, Inc.

2. Centrifugal Roof Ventilators:

   a. Acme Engineering & Mfg. Corp.
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.
   d. Penn Ventilation Companies, Inc.

3. Ceiling-Mounting Ventilators:
   a. Broan Mfg. Co., Inc.
   b. Carnes Company HVAC.
   c. Cook, Loren Company.
   d. Greenheck Fan Corp.
   e. NuTone Inc.
   f. Penn Ventilation Companies, Inc.

4. In-Line Centrifugal Fans:

   a. Acme Engineering & Mfg. Corp.
   b. Cook, Loren Company.
   c. Greenheck Fan Corp.
   d. Penn Ventilation Companies, Inc.

2.2 UTILITY SET FANS

A. Description: Belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.

B. Housing: Fabricated of galvanized with side sheets fastened with a deep lock seam or welded to scroll sheets.

1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; backward inclined aluminum wheel, with hub keyed to shaft.

1. Blade Materials: Aluminum.
2. Blade Type: Backward inclined.
3. Spark-Resistant Construction: AMCA 99.

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

F. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor: 1.5.
2. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
4. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades and felt edges in steel frame installed on fan discharge.
2. Access Doors: Gasketed doors with latch-type handles.
3. Scroll Dampers: Single-blade damper installed at fan scroll top with adjustable linkage.
4. Inlet Screens: Removable wire mesh.
5. Drain Connections: NPS 3/4 (DN 20) threaded coupling drain connection installed at lowest point of housing.
6. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.

H. Coatings: Powder-baked enamel.

I. Basis of Design: Loren Cook Model “CPA”.

2.3 CENTRIFUGAL ROOF VENTILATORS

A. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain drain.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent for direct drive models.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 13 1/2 inches.
3. Pitch Mounting: Manufacture curb for roof slope.

2.4 CEILING-MOUNTING VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
4. Isolation: Rubber-in-shear vibration isolators.

G. Basis of Design: Cook “Gemini”

2.5 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

G. Basis of Design: Cook Model “SQN”

2.6 MOTORS

A. Enclosure Type: Guarded dripproof.

2.7 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 15 Section "Mechanical Vibration Controls."

1. Secure vibration controls to concrete bases using anchor bolts cast in concrete base.

C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

E. Ceiling Units: Suspend units from structure.

F. Support suspended units from structure using threaded steel rods and spring hangers. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration Controls."

G. Install units with clearances for service and maintenance.

H. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.
6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
7. Disable automatic temperature-control operators.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 15838

SECTION 15840 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Shutoff single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

   1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale (1/4”=1’0”), on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

   1. Instructions for resetting minimum and maximum air volumes.
   2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship.
   1. Provide 3 year parts and labor warranty on the entire assembly.

1.6 COORDINATION

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:
   1. Environmental Technologies, Inc.; Enviro-Air Div.
   2. Nailor Industries of Texas Inc.
   3. Price Industries.
   4. Titus.

B. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.

C. Casing: 22 gauge steel.

1. Casing Lining: 1-inch- thick, coated, fibrous-glass duct liner complying with ASTM C 1071; secured with adhesive. Cover liner with nonporous foil.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 1-1/2 percent of nominal airflow at 6-inch wg inlet static pressure.
2. Damper Position: Normally open.

E. Electric Heating Coil: Slip-in-type, open-coil design with integral control box factory wired and installed. Include the following features:

1. Primary and secondary overtemperature protection.
2. Airflow switch.
3. Noninterlocking disconnect switch.
4. Magnetic contactor for each step of control (for three-phase coils).

F. Volume Damper: Construct of 18 ga. galvanized steel riveted or bolted through a solid core damper shaft with peripheral gasket and self-lubricating bearings. Gaskets shall be mechanically fastened to blade.

~~1.~~ Maximum Damper Leakage: 1.5 percent (2% fan-powered) of airflow at 6-inch wg inlet static pressure per ARI 880 test procedures.

~~G.~~ Controller shall be capable of maintaining design flow plus 5% regardless of inlet static pressure from minimum specified to 6” wg. Utilizing a multi-port sensing device (4 minimum radially distributed points) connected to center averaging chamber.

2.3 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

B. Verification of Performance: Rate air terminal units according to ARI 880.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air terminal units to allow service and maintenance.

C. Connect ducts to air terminal units according to Division 15 Section "Metal Ducts."

D. Ground units with electric heating coils according to Division 16 Section "Grounding and Bonding."

E. Connect wiring according to Division 16 Section "Conductors and Cables."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions and do the following:

a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
b. Verify that controls and control enclosure are accessible.
c. Verify that control connections are complete.
d. Verify that nameplate and identification tag are visible.
e. Verify that controls respond to inputs as specified.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 15840

SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Ceiling and wall mounted diffusers, registers, and grilles.

B. Related Sections:

   1. Division 10 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
   2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 Manufacturers:

A.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. METALAIRE, Inc.
   b. Price Industries.
   c. Titus.

2. Refer to drawings for air device accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 15855

SECTION 15900 – INSTRUMENTATION AND CONTROL FOR HVAC

A. General Requirements

1. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section. Exact OEM equivalents of specified actuators/operators shall be acceptable if clearly identified in submittals.
2. The manufacturer shall be ISO 9001 certified.

B. Electronic Damper Actuators

1. Spring Return Actuators:
    a. Manufactured, brand labeled or distributed by Johnson Controls or approved equal.
    b. Regulatory Agency Listing: cULus ,CSA C22.2 No. 24-93, and CE marked.
    c. Direct-Coupled Design: Requires no crankarm or linkage for mounting to a shaft.
    d. Coupling: toothed V-bolt clamp and nuts with toothed cradle.
    e. Reversible Mounting: Provides either clockwise or counterclockwise operation.
    f. Power Failure Operation: Mechanical spring return system drives load to the home position. Other forms of internal energy storage for power failure operation are not acceptable.
    g. Motor Technology:
        i. Modulating Types: Microprocessor-controlled Brushless DC motor.
        ii. On/Off Types: DC brush motor.
    h. Overload Protection: Electronic stall detection protects from overload at all angles of rotation without the use of end switches.
    i. Enclosure Ratings:
        i. NEMA type 2 / IP54 mounted in any orientation.
    j. Double-Insulated construction: Eliminate the need for electrical ground wires.
    k. Wiring: Integral cables with colored and numbered conductors.
    l. Sized for torque required to seal damper at load conditions.
    m. Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.
    n. Proportional actuators shall be user configurable without the use of external computer software or programming tools. Calibration, input signal range selection, and control logic reversal shall be selectable with an external mode selection switch.
    o. Operating Temperature Range:
        i. 70 lb·in. Torque and below: -40°F to 140°F.
        ii. 71 lb·in. Torque and above: -40°F to 131°F.
    p. Power Requirements:
        i. Modulating Types:

- 27 lb·in. Torque and Below: 5VA maximum.
- 70 lb·in. to 19 lb·in.Torque: 8VA maximum.
- 89 lb·in. to 71 lb·in.Torque: 10VA maximum.
- 90 lb·in. to 177 lb·in.Torque: 16VA maximum.

ii. 2-Position Types:

- 27 lb·in. Torque and Below: 5VA maximum.
- 70 lb·in. to 19 lb·in.Torque: 7VA maximum.
- 71 lb·in. to 177 lb·in.Torque: 25VA maximum.

2. Non-Spring Return Actuators
   a. Manufactured, brand labeled or distributed by Johnson Controls or approved equal.
   b. Regulatory Agency: Underwriters Laboratories (UL) Listed, CSA Certified, and CE marked.
   c. Direct-Coupled Design: Requires no crank arm or linkage for mounting to a shaft.
   d. Coupling:
      i. Above 80 lb.·in.: toothed V-bolt clamp and nuts with toothed cradled.
      ii. 80 lb.·in. and below: single cup-point set screw and toothed cradle.
   e. Overload Protection: Electronic stall detection or magnetic slip clutch protects from overload at all angles of rotation without the use of end switches.
   f. Minimum Enclosure Ratings:
      i. Types with covered wiring terminals: NEMA type 2 / IP42 mounted in any orientation.
      ii. Types without covered wiring terminals: NEMA type 1 / IP30 or IP40.
      iii. Types with integrated cables: NEMA 2 / IP42 mounted in any orientation.
   g. Sized for torque required to seal damper at load conditions.
   h. Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.
   i. Proportional actuators shall be user configurable without the use of external computer software or programming tools.
   j. Operating Temperature Range: -4°F to 122°F except for VAV and similar indoor applications in which case 32°F to 122°F is acceptable.
   k. Power Requirements: 24 V with models available for both 24 VAC and 24 VDC operation, maximum:
      i. Above 80 lb.·in.: 7.5 VA at 24 VAC.
      ii. 80 lb.·in. and below: 3.5 VA at 24 VAC.
   l. The manufacturer shall provide 5-year limited warranty from the date of sale covering defects in material or workmanship.

Sensors and Transmitters

A. General Requirements

1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements. Exact OEM equivalents of specified sensors and transmitters shall be acceptable if clearly identified in submittals.

B. Temperature Sensors

1. General Requirements

a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD. Thermistor sensors of 10,000 or 2,250 ohms resistance may be substituted based on the application.

c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion.

Point Type	Accuracy
Chilled Water	+ .5°F
Room Temp	+ .5°F
Duct Temperature	+ .5°F
All Others	+ .75°F

2. Room Temperature Sensors

a. Room sensors shall be constructed for either surface or wall box mounting.

b. Room sensors shall have the following options when specified:

i. Setpoint warmer/cooler.

ii. Individual heating/cooling setpoint.

iii. Momentary override request for activation of after-hours operation.

iv. Analog thermometer.

3. Room Temperature Sensors with Integral Display

a. Room sensors shall be constructed for either surface or wall box mounting.

b. Room sensors shall have an integral LCD display and the following capabilities when specified:

i. Display room air temperatures.

ii. Display and adjust room comfort setpoint.

iii. Display and adjust fan operation status.

iv. Setpoint override request via setpoint adjust dial or buttons.

v. Timed override request via occupancy override with status indication for activation of after-hours setpoint operation.

vi. Occupancy sensor status.

vii. Toggle between Degrees F and Degrees C.

viii. Toggle between temperature and humidity where specified.

4. Thermowells
   a. Thermowell manufacturer shall have models available in stainless steel, brass body, and copper bulb.
   b. When thermowells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and sensor.
   c. Thermowells shall be pressure rated and constructed in accordance with the system working pressure.
   d. Thermowells and sensors shall be mounted in a direct mount (no adapter) offering faster installation or 1/2" NFT saddle and allow easy access to the sensor for repair or replacement.
   e. Thermowells constructed of 316 stainless steel shall comply with Canadian Registration Number (CRN) pressure vessel rating.
5. Outside Air Sensors
   a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall be provided with a solar shield.
   b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
   c. Temperature transmitters shall be of NEMA 3R (IP54) or NEMA 4 (IP65) construction and rated for ambient temperatures.
   d. The outdoor sensor shall be capable of being mounted on a roof, pole or side of a building utilizing its preassembled mounting bracket.
   e. Outside air relative humidity sensors 0-100% full range of accurate measurement. Operating temperature -4 to 140°F (-20 to 60°C).
   f. Outside air temperature sensors operating temperature range -40 to 140°F, +/- .55°F (+/- .3°C).
6. Duct Mount Sensors
   a. Duct mount sensors shall mount in an electrical box through a hole in the duct, positioned to provide ease of accessibility for repair or replacement.
   b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
   c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be provided.
7. Averaging Sensors
   a. For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
   b. For plenum applications, such as mixed air temperature measurements, a continuous averaging sensor or a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.

c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

8. Acceptable Manufacturers: Johnson Controls, Minco.

Automated Logic

C. Humidity Sensors

1. The sensor shall be a solid-state type, relative humidity sensor of the Thin Film Capacitance or Bulk Polymer Design. The sensor element shall resist service contamination.
2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH at 77°F unless specified elsewhere.
4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R (IP54) or NEMA 4 (IP65) enclosure with sealtite fittings.
5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.
7. Acceptable Manufacturers: Johnson Controls and Vaisala.

D. CO_2 Sensors

1. Where shown on the drawings, CO_2 sensors shall have the following features:
   a. Jumper selectable: 0-20mA, 4-20mA & 0-10 VDC output.
   b. Liquid Crystal Display (LCD).
2. The CO_2 sensors shall have the ability to monitor and output the following variables as required by the systems sequence of operations:
   a. Zone CO_2.
3. The CO_2 shall transmit the information back to the controller via jumper selectable 0-20mA, 4-20mA & 0-10 VDC output signals:
   a. The CO_2 sensors shall provide a maximum output current of 25mA; Maximum output voltage of 12.5V.
   b. The CO_2 sensors shall be FCC compliant to CFR47 Part 15 subpart B Class A.
4. The CO_2 sensors shall be available with:
   a. CO_2 response time (0-63%) of 1 minute.
   b. Less than 0.083% of full scale/°F temperature dependence of CO_2 output.
   c. Long term CO_2 stability ±5% of full scale for 5 years.
   d. CO_2 measurement accuracy of ±(40ppm + 2.0% of reading.)
   e. CO_2 non-linearity of less than 1.0% of full scale.
5. The CO_2 sensors may include the following items:
   a. Relay output module.
   b. LCD module.
   c. Analog temperature module with linear 0-10 VDC output for 32-122F.

E. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:

   a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.

   b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.

   c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.

   d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.

2. Low Differential Water Pressure Applications (0” - 20” WC):

   a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of flow meter differential pressure or water pressure sensing points.

   b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:

      i. .01-20” WC input differential pressure range.

      ii. 4-20 mA output.

      iii. Maintain accuracy up to 20 to 1 ratio turndown.

      iv. Reference Accuracy: +0.2% of full span.

   c. Acceptable Manufacturers: Setra and Mamac.

3. Medium to High Differential Water Pressure Applications (Over 21” WC):

   a. The differential pressure transmitter shall meet the low-pressure transmitter specifications with the following exceptions:

      i. Differential pressure range 10” WC to 300 PSI.

      ii. Reference Accuracy: +1% of full span (includes non-linearity, hysteresis, and repeatability).

   b. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.

   c. Acceptable Manufacturers: Setra and Mamac.

4. Building Differential Air Pressure Applications (-1” to +1” WC):

   a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.

b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:

i. -1.00 to +1.00 WC input differential pressure ranges. (Select range appropriate for system application.)

ii. 4-20 mA output.

iii. Maintain accuracy up to 20 to 1 ratio turndown.

iv. Reference Accuracy: +0.2% of full span.

v. Acceptable Manufacturers: Johnson Controls or approved equal.

5. Low Differential Air Pressure Applications (0" to 2.5" WC):

a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.

b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications.

i. (0.00 - 1.00" to 5.00") WC input differential pressure ranges. (Select range appropriate for system application.)

ii. 4-20 mA, 0-5 VDC, 0-10 VDC output.

iii. Maintain accuracy up to 20/1 ratio turndown.

iv. Reference Accuracy: +0.25%, or 0.5% of full span.

c. Acceptable Manufacturers: Johnson Controls and Ruskin.

6. Medium Differential Air Pressure Applications (5" to 21" WC):

a. The pressure transmitter shall be similar to the Low Air Pressure Transmitter, except that the performance specifications are not as severe. Differential pressure transmitters shall be provided that meet the following performance requirements.

i. Zero & span: (c/o F.S./Deg. F): .04% including linearity, hysteresis and repeatability.

ii. Accuracy: 1% F.S. (best straight line) Static Pressure Effect: 0.5% F.S. (to 100 psig.

iii. Thermal Effects: <+.033 F.S./Deg. F. over 40°F to 100°F (calibrated at 70°F.)

b. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.

c. Acceptable manufacturers: Johnson Controls and Ruskin.

F. Flow Monitoring

1. Air Flow Monitoring

a. Fan Inlet Air Flow Measuring Stations

i. At the inlet of each fan and near the exit of the inlet sound trap, airflow sensors shall be provided that shall continuously monitor the fan air volumes or velocity pressure.

ii. Each sensor shall be surface mount type. Unit shall be capable of monitoring and reporting the airflow and temperature at each fan inlet location through two or four sensing circuits. If a static pressure manifold is used, it shall incorporate dual offset static tips on the opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as + 20° in the approaching air stream.

iii. Devices creating fan performance degradation, resulting in additional energy consumption, caused from pressure drop associated with probes or mounting apparatus in the center of the fan inlet are not allowed. The device shall not induce a significant pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presence in the air stream. Sensor circuit casings shall be constructed of U.L. 94 flame rated high impact ABS and include a stainless steel thermistor cap that maintains the precise calibrated flow over the heated and ambient measurement points.

iv. Acceptable manufacturers: Johnson Controls, Air Monitor Corp., Tek-Air Systems, Inc., or Dietrich Standard.

b. Single Probe Air Flow Measuring Sensor

i. The single probe airflow-measuring sensor shall be duct mounted with an adjustable sensor insertion length of up to eight inches. The transmitter shall produce a 4-20 mA or 0-10 VDC signal linear to air velocity. The sensor shall be a thermal dispersion and utilize one temperature sensor and a heated thermistor. The sensor pair shall measure the air temperature and airflow velocity.

c. Duct Air Flow Measuring Stations

i. Furnish and install, at locations shown on plans or as in accordance with schedules, an equalized air measuring probe system piped to a high performance pressure transducer or an electronic type airflow temperature measuring station.

ii. Each device shall be designed and built in order to comply with, and provide results in accordance with, accepted practice as defined for system testing in the ASHRAE Handbook of fundamentals, as well as in the Industrial Ventilation Handbook.

iii. Assembly shall be AMCA tested and capable of measuring a range from 70 to 5,000 FPM (22 to 1524 MPM).

iv. Equalized air measuring assembly shall measure to ±3% average and consist of 6063T5 extruded aluminum step sensing blade(s) with anodized finish, plenum-rated polyethylene pressure tubing, brass barbed fittings, mounting hardware and a glass-on-silicone capacitance sensor pressure transducer capable of measuring up to five field-selectable pressure ranges up to 2.5 in. WC.

v. The transducer shall be accurate to ±0.5%, or 0.25% of full scale and be contained in a National Electrical Manufacturer's Association (NEMA) 4 (IP-65) enclosure. Transducer shall be factory mounted and piped to high and low pressure ports through fittings made of brass.

vi. All sensor tubing shall terminate in solid brass barbed fittings.

vii. Total and static pressure manifolds shall terminate with external ports for connection to control tubing. An identification label shall be present on each unit casing, listing model number, size, area, and airflow capacity.

viii. Air straightener shall be provided for sizes over 17 square feet (1.6 sq meter).

ix. Airflow measuring station assemblies shall be fabricated of galvanized steel or aluminum casing of appropriate thickness for slip fits or with 90 Deg. connecting flanges in configuration and size equal to that of the duct into which it is mounted. Each station shall be complete with an air directionalizer and parallel cell profile suppressor (3/4" maximum cell) across the entering air stream and mechanically fastened to the casing in such a way to withstand velocities up to 5000 feet per minute.

x. Electronic air measuring station shall be capable of monitoring and reporting the airflow and temperature at each measuring location through one or more measuring probes containing multiple sensor points and a control transmitter that outputs a 4-20 mA linear signal.

xi. Probe(s) shall be constructed of an airfoil shaped aluminum extrusion containing the sensor circuit(s).

xii. Each sensor circuit shall consist of coated thermistors, for temperature and velocity, mounted to a Printed Circuit Board (PCB). Multiplexer board shall be encased to prevent moisture damage.

xiii. Control transmitter shall be capable of processing independent sensing points and shall operate on a fused 24 VAC supply.

xiv. Control transmitter shall feature a 16 x 2 character alphanumeric LCD screen, digital offset/gain adjustment, continuous performing sensor/transmitter diagnostics, and a visual alarm to detect malfunctions.

xv. Installation Considerations

- The maximum allowable pressure loss through the Flow and Static Pressure elements shall not exceed .04" WC at 1000 feet per minute, or .11" WC at 2000 feet per minute. Each unit shall measure the airflow rate within an accuracy of plus 3-5% as determined by AMCA.
- Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct. Station flanges shall be 1.5 inches to facilitate matching connecting ductwork.
- Where control dampers are provided as part of the airflow measuring station, parallel blade precision controlled volume dampers integral to the station and complete with actuator, and linkage shall be provided.
- Stations shall be installed in strict accordance with the manufacturer's published requirements, and in accordance with ASME Guidelines affecting non-standard approach conditions.

xvi. All air measuring devices shall be tested according to AMCA Standard 610.

xvii. Acceptable manufacturers: Johnson Controls, Air Monitor Corp., Tek-Air, Ruskin, and Dietrich Standard.

d. Static Pressure Traverse Probe

i. Duct static traverse probes shall be provided where required to monitor duct static pressure. The probe shall contain multiple static pressure sensors located along exterior surface of the cylindrical probe.

ii. Acceptable manufacturers: Cleveland Controls.

e. Shielded Static Air Probe

i. Where indicated on plans or in schedules a shielded static pressure probe shall be provided at each end of the building. The probe shall have multiple sensing ports, an impulse suppression chamber, and airflow shielding.

f. Water Flow Monitoring

i. Water flow meters shall be electromagnetic type with integral microprocessor-Based electronics. The meter shall have an accuracy of 0.25%.

ii. Acceptable manufacturers: Onicon.

G. Power Monitoring Devices

1. Current Measurement (amps)

a. Current measurement shall be by a combination current transformer and a current transducer. The current transformer shall be sized to reduce the full amperage of the monitored circuit to a maximum 5 Amp signal, which will be converted to a 4-20 mA DDC compatible signal for use by the Facility Management System.

b. Current Transformer – A split core current transformer shall be provided to monitor motor amps.

i. Operating frequency – 50 - 400 Hz.

ii. Insulation – 0.6 Kv class 10Kv BIL.

iii. UL recognized.

iv. Five amp secondary.

v. Select current range as appropriate for application.

vi. Acceptable manufacturers: Setra.

c. Current Transducer – A current to voltage or current to mA transducer shall be provided. The current transducer shall include:

i. 6X input over amp rating for AC inrushes of up to 120 amps.

ii. Manufactured to UL 1244.

iii. Accuracy: +.5%, Ripple +1%.

iv. Minimum load resistance 30kOhm.

v. Input 0-20 amps.

vi. Output 4-20 mA.

vii. Transducer shall be powered by a 24 VDC regulated power supply (24 VDC +5%).

viii. Acceptable manufacturers: Setra.

H. Refrigerant Leak Detectors

1. The refrigerant leak detector shall be a standalone device and shall provide SPDT switch contacts to directly energize the refrigeration room exhaust ventilation fans. The detector shall include a sensor or sensors connected to a control panel. Two relay contacts at the control panel shall provide trouble and alarm indication to the Facility Management System. The alarm relay contact shall also directly energize the exhaust fans.
2. The refrigerant leak detector shall sense the type of refrigerant used in the specified chillers. Multiple sensors shall be required to detect different refrigerants and/or provide proper sensing coverage for the area of the refrigeration room.
3. Acceptable manufacturers: Johnson Controls, MSA Instruments.

I. Smoke Detectors

1. Ionization type air duct detectors shall be furnished as specified elsewhere in Division 26 for installation under Division 23. All wiring for air duct detectors shall be provided under Division 26, Fire Alarm System.

J. Status and Safety Switches

1. General Requirements
   a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the Building Management System (BMS) when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.
2. Current Sensing Switches
   a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
   b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
   c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
   d. Acceptable manufacturers: Johnson Controls or approved equal.
3. Air Filter Status Switches
   a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
   b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
   c. Provide appropriate scale range and differential adjustment for intended service.
   d. Acceptable manufacturers: Johnson Controls, Cleveland Controls.
4. Air Flow Switches
   a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.

b. Acceptable manufacturers: Johnson Controls, Cleveland Controls.

5. Air Pressure Safety Switches
   a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
   b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
   c. Acceptable manufacturers: Johnson Controls, Cleveland Controls.
6. Water Flow Switches
   a. Water flow switches shall be equal to the Johnson Controls P74.
7. Low Temperature Limit Switches
   a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
   b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
   c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.
   d. The low temperature limit switch shall be equal to Johnson Controls A70.

K. Control Relays
1. Control Pilot Relays
   a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
   b. Mounting Bases shall be snap-mount.
   c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
   d. Contacts shall be rated for 10 amps at 120VAC.
   e. Relays shall have an integral indicator light and check button.
   f. Acceptable manufacturers: Johnson Controls, Lectro.
2. Lighting Control Relays
   a. Lighting control relays shall be latching with integral status contacts.
   b. Contacts shall be rated for 20 amps at 277 VAC.
   c. The coil shall be a split low-voltage coil that moves the line voltage contact armature to the On or Off latched position.
   d. Lighting control relays shall be controlled by:
      i. Pulsed Tristate Output – Preferred method.
      ii. Pulsed Paired Binary Outputs.
      iii. A Binary Input to the Facility Management System shall monitor integral status contacts on the lighting control relay. Relay status contacts shall be of the “dry-contact” type.

e. The relay shall be designed so that power outages do not result in a change-of-state, and so that multiple same state commands will simply maintain the commanded state. Example: Multiple Off command pulses shall simply keep the contacts in the Off position.

L. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
2. The signal isolation transducer shall provide ground plane isolation between systems.
3. Signals shall provide optical isolation between systems.
4. Acceptable manufacturers: Advanced Control Technologies.

M. Electronic/Pneumatic Transducers

1. Electronic to Pneumatic transducers shall provide:
   a. Output: 3-15 psig.
   b. Input: 4-20 mA or 0-10 VDC.
   c. Manual output adjustment.
   d. Pressure gauge.
   e. External replaceable supply air filter.
2. Acceptable manufacturers: Johnson Controls, Mamac.

N. Thermostats – Electric

1. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.
2. Acceptable Manufacturers: Penn, Emerson, Honeywell.

Control Valves

A. Ball Valves, 1/2 through 2 in.

1. Ball Valves shall have forged brass bodies.
2. Valves shall have available either Chrome Plated Brass Balls or 300 Series Stainless Steel Balls in all sizes.
3. Valves shall have available either Nickel Plated Brass Stems or 300 Series Stainless Steel Stems with a blow-out proof stem design in all sizes.
4. Valves shall have Graphite reinforced Polytetrafluoroethylene (PTFE) seats with Ethylene Propylene Diene Monomer (EPDM) O-ring backing.
5. Stem seals shall be double EPDM O-rings.
6. Flow Characterization Disk shall be manufactured from Amodel AS-1145HS Polyphthalamide Resin and rated for 50 psi maximum differential pressure and shall be inserted against the casting of the valve.

7. All ball valves with internal pipe thread end connections shall be rated to 580 psi maximum static pressure at 203°F (95°C) fluid temperature.
8. All ball valves with sweat end connections or press end connection shall be rated to 300 psig maximum static pressure at 203°F (95°C) fluid temperature.
9. All valves shall be rated for service with hot water, chilled water and 50% glycol solutions.
10. Ball Valves with stainless steel balls and stems shall be rated for use with 15 psig saturated steam.
11. Flow Characteristics shall be equal percentage on the control port. Bypass port on three-way valves shall have linear flow characteristics.
12. Valves shall have a maximum leakage specification of 0.01% of maximum flow for the control port, ANSI/FCI 70-2, Class 4 and 1% of maximum flow, bypass port.
13. Valves shall be maintenance free.
14. Valves shall be provided with a 5 year equipment warranty.
15. Valves shall be rated for 200 psi differential closeoff pressure.
16. Valve actuators shall be UL-recognized or CSA-certified.
17. Valves shall be Johnson Controls VG1000 Series ball valves or approved equal.

B. Ball Valves, 2-1/2 through 4 in. Flanged

1. Ball Valves shall have forged brass bodies with ASME Class 150 ductile iron flanges.
2. Valves shall have 300 Series Stainless Steel Balls.
3. Valves shall have 300 Series Stainless Steel Stems with a blowout proof stem design.
4. Valves shall have Graphite reinforced PTFE seats with EPDM O-ring backing.
5. Stem seals shall be double EPDM O-rings.
6. Flow Characterization Disk shall be manufactured from Amodel AS-1145HS Polyphthalamide Resin and rated for 50 psi maximum differential pressure.
7. Flow Characteristics shall be equal percentage on the control port. Bypass port on three-way valves shall have linear flow characteristics.
8. Valves shall have a maximum leakage specification of 0.01% of maximum flow for the control port, ANSI/FCI 70-2, Class 4 and 1% of maximum flow, bypass port.
9. All valves shall be rated for service with hot water, chilled water, 50% glycol solutions and rated for use with 25 psig saturated steam.
10. Two-Way Valves shall be rated for 100 psi differential closeoff pressure and Three-Way Valves shall be rated for 50 psi differential closeoff pressure.
11. Valves shall be maintenance free.
12. Valves shall be provided with a 5 year equipment warranty.
13. Valve actuators shall be UL-recognized or CSA-certified.
14. Valves shall be Johnson Controls VG1000 Series ball valves or approved equal.

C. Butterfly Valves, 2 through 20 in. resilient seat ASME Class 125/150 Flanged

1. Butterfly Valves shall have cast iron bodies meetings ASTM A126 Class B requirements and meet ASME class 125/150 flange requirements and shall be fully lugged.
2. Butterfly Valves seat shall be EPDM.
3. Butterfly Valve disk shall be Ductile Iron with Nylon 11 coating.
4. Butterfly Valve stems shall be Stainless Steel.
5. Flow Characteristics shall be equal percentage up to 70° of disk rotation.
6. All valves shall be rated for service with hot water, chilled water and 50% glycol solutions.
7. Valves shall be maintenance free.
8. Valve shall be provided with a 3 year equipment warranty.
9. Valve electric actuators shall be UL-recognized or CSA-certified.
10. Valves shall be Johnson Controls VF Series butterfly valves or approved equal.

D. Butterfly Valves, High Performance 2-1/2 through 16 in.

1. Butterfly Valves shall have bodies manufactured from Carbon Steel, ASTM A216 GR WCB/A516 GR 70 and shall be fully lugged per ASME Class 150 or ASME Class 300.
2. Butterfly Valves seat assembly shall be RPTFE (reinforced polytetrafluoroethylene) and the seat retainer shall be Carbon Steel, ASTM A516 GR 70.
3. Butterfly Valve disk shall be Stainless Steel, ASTM A 351 GR CF8M.
4. Butterfly Valve stems shall be 17-4 PH Stainless Steel, ASTM A564-Type 630.
5. Butterfly Valve Stem Seals shall be One Carbon Fiber Ring and Three TFE Rings.
6. Flow Characteristics shall be equal percentage up to 70° of disk rotation.
7. All valves shall be rated for service with hot water, chilled water, 50% glycol solutions and 50 psig saturated steam in modulating service or 150 psig saturated steam in two-position service.
8. Butterfly Valves shall meet the performance requirements of ASME Class 150 or Class 300.
9. Valves shall be maintenance free.
10. Valves shall be provided with a 3 year equipment warranty.
11. Valve electric actuators shall be UL-recognized or CSA-certified.
12. Valves shall be Johnson Controls VF Series butterfly valves or approved equal.

E. Globe Valves, Brass, 1/2 through 2 in.

1. Valves shall have bodies manufactured from a RoHS compliant brass.
2. Valves shall meet the pressure and temperature requirements of ANSI B16.15, Class 250.
3. Valve stems shall be a 300 Series Stainless Steel.
4. Valves with brass plug and seat shall have stem seals with Self-Adjusting Ethylene Propylene Rubber (EPR) Ring Pack U-Cups.
5. Valves with Stainless Steel plug and seat shall valve stem seals with Spring Loaded PTFE and Elastomer V-Rings.

6. Valves with brass trim shall have a maximum leakage specification of 0.01% of maximum flow per ANSI/FCI 70-2, Class 4 and valves with stainless steel trim shall have a maximum leakage of 0.05% of maximum flow.
7. Flow Characteristics shall be equal percentage for two-way valves and linear for three-way valves.
8. Valves shall be serviceable without being removed from the pipe.
9. Valves shall be provided with a 3 year equipment warranty.
10. Valve electric actuators shall be UL-recognized or CSA-certified.
11. Valves shall be Johnson Controls VG7000 Series globe valves or approved equal.

F. Globe Valves, Cast Iron, 2-1/2 through 6 in.

1. Valves shall have bodies manufactured from cast iron.
2. Valves shall meet the pressure and temperature requirements of ANSI B16.1, Class 125.
3. Valve stems shall be a 316 Series Stainless Steel.
4. Valves shall have stem seals with Ethylene Propylene Terpolymer (EPT) Ring Pack U-Cups.
5. Valves shall have a maximum leakage specification of 0.1% of maximum flow per ANSI/FCI 70-2, Class 3.
6. Flow Characteristics shall be equal modified linear.
7. Valves shall be serviceable without being removed from the pipe.
8. Valves shall be provided with a 3 year equipment warranty.
9. Valve electric actuators shall be UL-recognized or CSA-certified.
10. Valves shall be Johnson Controls VG2000 Series globe valves or approved equal.

G. Electric Zone Valves, 1/2 through 1-1/4 in.

1. Valves shall have bodies manufactured from Forged Brass.
2. Valves stems shall be brass (Hard Chrome Plated.)
3. Valve Actuator shall be UL, cUL listed or CSA certified.
4. Valves shall be rated for service with hot water, chilled water and 50% glycol solutions.
5. Two Position valves shall have models available rated for use with 15 psig saturated steam.
6. Valve Actuator shall be replaceable without removing valve from the pipe.
7. Modulating Valves flow characteristics shall be equal percentage.
8. Valves shall be provided with a 2 year equipment warranty.
9. Valve actuators shall be UL-recognized or CSA-certified.
10. Valves shall be Johnson Controls J Series electric zone valves or approved equal.

H. Pressure Independent Valves, 1/2 through 2 in.

1. Valves bodies shall be manufactured from forged brass and shall be nickel plated.
2. Valves shall have a stem and ball manufactured from chrome plated brass.

3. Valve seat shall be fiberglass reinforced with Teflon®.
4. Characterizing disk shall be brass for 1/2 and 3/4 in. valves, and Tefzel® for sizes 1 through 2 in. valves.
5. Valves shall pressure ratings of 600 psi for 1/2, 3/4 and 1 in. size valves, and pressure rating of 400 psi for 1-1/4, 1-1/2 and 2 in. size valves.
6. Closeoff Pressure rating shall be 200 psi differential pressure.
7. Valves shall have a maximum leakage specification of 0.01% of maximum flow per ANSI/FCI 70-2, Class 4 with a 50 psi differential pressure applied.
8. Valves shall be maintenance free.
9. Valves shall be provided with a 5 year equipment warranty.
10. Valve actuators shall be UL-recognized or CSA-certified.
11. Valves shall be Johnson Controls P1000 Series pressure independent valves or approved equal.

Control Dampers

A. The BMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BMS Contractor or as specifically indicated on the drawings.

B. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.

C. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.

D. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60”. Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48”x48” size shall not leak in excess of 8.0 cfm per square foot when closed against 4” WC static pressure when tested in accordance with AMCA Std. 500.

E. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5” WC, but no more than 4000 FPM or 6” WC.

   1. Acceptable manufacturers are Johnson Controls VD-1250, VD1630, or VD-1330, Ruskin CD50 or CD60, and Vent Products 5650.

F. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.

   1. Acceptable manufacturers: Johnson Controls VD-1620, VD-1320, Ruskin CD36, and Vent Products 5800.

G. Multiple section dampers may be jack-shafted to allow mounting of piston pneumatic actuators and direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

END OF SECTION 15900

SECTION 15901 – Building Automation System

Table of Contents

Part 1 – General

1.A Related Documents

1. All work of this Division shall be coordinated and provided by the single BMS Contractor.
2. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the applicable sections for details.
3. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
4. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.B Definitions

1. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
2. Binary: A two-state system where an “on” condition is represented by one discrete signal level and an “Off” condition is represented by a second discrete signal level.
3. BMS: The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BMS Contractor and to be interfaced to the associated work of other related trades.
4. BMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BMS work.
5. Control Sequence: A BMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.
6. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.
7. BMS Network: The total digital on-line real-time interconnected configuration of BMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.
8. Node: A digitally programmable entity existing on the BMS network.
9. BMS Integration: The complete functional and operational interconnection and interfacing of all BMS work elements and nodes in compliance with all applicable codes, standards and ordinances to provide a single coherent BMS as required by this Division.
10. Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.
11. PC: Personal Computer from a recognized major manufacturer or a virtual equivalent provided by, or with the consent of the owner.
12. Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the BMS Contractor’s expense to the designated third party trade contractor for

installation. BMS Contractor shall connect furnished items to the BMS, calibrate, test, commission, warrant and document.

13. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.
14. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.
15. Protocol: The term “protocol” and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BMS network nodes.
16. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BMS industry for real-time, on-line, integrated BMS configurations.
17. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.
18. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

1.C BMS System Description

1. The BMS shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner’s IT staff to ensure that the BMS will perform in the owner’s environment without disruption to any of the other activities taking place on that LAN.
2. Any and all components of the BMS that are connected via field bus or IP network, including the network controllers, field controllers, application specific controllers, server and user interface software, system and controller programming tools and software applications shall be designed, engineered, and tested to work together as a complete building management system, and shall be manufactured by the same BMS manufacturer. Systems that use or require network controllers, field controllers, application specific controllers, server and user interface software, programming tools and software from more than one BMS manufacturer shall not be accepted.
3. All points of user interface shall be on standard computing devices that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these devices will be a standard Web Browser.
4. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.
5. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples,

submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

6. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.
7. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as not to impede or delay the work of associated trades.
8. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
    a. Operator information, alarm management and control functions.
    b. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
    c. Diagnostic monitoring and reporting of BMS functions.
    d. Energy management.
    e. Standard applications for terminal HVAC systems.
    f. Enterprise-wide information and control access.
    g. Offsite monitoring and management access.
    h. [Indoor Air Quality monitoring and control].

1.D Quality Assurance

1. General
    a. The BMS Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated BMS.
    b. The BMS Contractor shall be a recognized national manufacturer, installer and service provider of BMS.
    c. The BMS installer shall be a BMS manufacturer-owned branch office, or an independent controls contractor who is factory trained and authorized by the BMS manufacturer to sell, service and support the BMS specified herein.
    d. Independent controls contractors who are authorized by the BMS manufacturer must provide a letter written and signed by a company officer of the specific BMS manufacturer. This document must be dated within the 30 days prior to bid submittal and must state that they are currently a “direct authorized representative” in good standing for the BMS manufacturer for the building management system products described and listed in this specification, that they have “direct purchasing access” to all of the BMS manufacturer’s controllers, servers, software and components and technical support, and that they will continue to be an Authorized representative with this access for the duration of the installation and warranty phases of project.

e. If an independent controls contractor is to be considered via addendum, the contractor must provide a letter written by a company officer of the specific BMS manufacturer with the following verbiage; “should this contractor fail to provide a complete and operational system (as judged by the owner/engineer), the Manufacturer will complete the project to the Engineer’s satisfaction at no additional cost to the Owner”.

f. The BMS Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. The BMS Contractor shall have, at this facility, a trained, directly employed and full time technical staff, spare parts inventory, and all necessary test and diagnostic equipment.

g. As evidence and assurance of the contractor’s ability to support the Owner's system with service and parts, the contractor must have been in the BMS business for at least the last ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.

h. The BMS architecture shall consist of the products of a manufacturer regularly engaged in the production of BMS, and shall be the manufacturer’s latest standard of design at the time of bid.

2. Workplace Safety and Hazardous Materials

a. Provide a safety program in compliance with the Contract Documents.

b. The BMS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.

c. The Contractor and its employees and sub-trades shall comply with federal, state and local safety regulations.

d. The Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work, and that their employees receive the training required by the OSHA rules that have jurisdiction for at least each topic listed in the Safety Certification Manual.

e. Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.

f. Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.

g. The Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractor’s company is in full compliance with the Project safety requirements.

h. The Contractor’s safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the AHJ at the Project site.

i. The Contractor’s employees and subcontractor’s staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

3. Quality Management Program

a. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:

- Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
- Manage the financial aspects of the BMS Contract.
- Coordinate as necessary with other trades.
- Be responsible for the work and actions of the BMS workforce on site.

1.E References

1. All work shall conform to the following Codes and Standards, as applicable:
   a. National Fire Protection Association (NFPA) Standards.
   b. National Electric Code (NEC) and applicable local Electric Code.
   c. UL listing and labels.
   d. UL 864 UUKL Smoke Control.
   e. UL 268 Smoke Detectors.
   f. UL 916 Energy Management.
   g. NFPA 70 – National Electrical Code.
   h. NFPA 90A – Standard For The Installation Of Air Conditioning And Ventilating Systems.
   i. NFPA 92A and 92B Smoke Purge/Control Equipment.
   j. Factory Mutual (FM).
   k. American National Standards Institute (ANSI).
   l. National Electric Manufacturer's Association (NEMA).
   m. American Society of Mechanical Engineers (ASME).
   n. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   o. Air Movement and Control Association (AMCA).
   p. Institute of Electrical and Electronic Engineers (IEEE).
   q. American Standard Code for Information Interchange (ASCII).
   r. Electronics Industries Association (EIA).
   s. Occupational Safety and Health Administration (OSHA).
   t. American Society for Testing and Materials (ASTM).
   u. Federal Communications Commission (FCC) including Part 15, RF Devices.
   v. Americans Disability Act (ADA).
   w. ANSI/EIA 909.1-A-1999 (LonWorks®).

x. ANSI/ASHRAE Standard 195 (BACnet).

y. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

2. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.F Work By Others

1. The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX.

BMS Responsibility Matrix

Work	Furnish	Install	Low Volt. Wiring/Tube	Line Power
BMS low voltage and communication wiring *[1] (note 1)	BMS	BMS	BMS	N/A
VAV box controller (note 2)	BMS	23*[2]	BMS	26
BMS conduits and raceway	BMS	BMS	BMS	BMS
Automatic dampers (non factory)	BMS	23	N/A	N/A
Automatic valves	BMS	23	BMS	N/A
VAV boxes	23	23	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations.	BMS	23	BMS	BMS
BMS Current Switches.	BMS	BMS	BMS	N/A
BMS Control Relays	BMS	BMS	BMS	N/A
Power distribution system monitoring interfaces	26	26	BMS	26
Concrete and/or inertia equipment pads and seismic bracing	23	23	N/A	N/A
BMS interface with Chiller controls	BMS	BMS	BMS	BMS
Chiller controls interface with BMS	23	23	BMS	26
Elect. baseboard heating control (note 3)	23	26*[3]	N/A*[3]	26
ADD OTHER THIRD PARTY EQUIPMENT HERE	N/A	N/A	N/A	N/A
All BMS Nodes, equipment, housings, enclosures and panels.	BMS	BMS	BMS	BMS
Smoke Detectors (note 4)	26	26	26/BMS *[4]	26
Fire/Smoke Dampers (note 5)	23	23	BMS*[5]	26
Fire Dampers	23	23	N/A	N/A
Chiller Flow Switches	23	23	BMS	N/A
Boiler wiring	23	23	23	23
Water treatment system	23	23	23	26

Work	Furnish	Install	Low Volt. Wiring/Tube	Line Power
VSDs	BMS	26	BMS	26
Refrigerant monitors	BMS	BMS	BMS	26
Computer Room A/C Unit field-mounted controls	23	23	BMS	26
Fire Alarm shutdown relay interlock wiring	26	26	26	26
Fire Alarm smoke control relay interlock wiring	26	26	BMS	26
Fireman's Smoke Control Override Panel	26	26	26	26
Fan Coil Unit controls	BMS	BMS	BMS	26
Cabinet/Unit Heater controls (note 6)	BMS/23*6	26/BMS*6	BMS	26
Packaged RTU space mounted controls	23	BMS	BMS	26
Packaged RTU factory-mounted controls	23	23	BMS	26
Packaged RTU field-mounted controls	BMS	BMS	BMS	26
Cooling Tower Vibration Switches	23	23	26	26
Cooling Tower Level Control Devices	23	23	26	26
Cooling Tower makeup water control devices	23	23	26	26
Starters, HOA switches	26	26	N/A	26
Control damper actuators	BMS	BMS	BMS	26

Footnotes:

*1. BMS low voltage and communications wiring: BMS Ethernet communications cable and IP infrastructure furnish and install by BMS Contractor or Division 26 Electrical Contractor as per options in Paragraph 2, A6 above.

*2. VAV box controller factory installation would normally be by Division 23 Mechanical who furnishes the VAV boxes; could be by BMS for field installation of special controllers, see item.

*3. Electric Baseboard Heating Controls – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who furnishes the baseboard units; line voltage controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring Baseboard Heating controls to be integrated into the BMS. Refer to Section 230993 SEQUENCE OF OPERATIONS.

*4. Smoke Detector also wired to shut down AHU/HVAC by BMS Contractor; Division 26 for projects NYC.

*5. Fire/Smoke Dampers: BMS Contractor to provide and ensure OPEN/CLOSE control of Fire/Smoke dampers as coordinated between BMS HVAC systems sequences, controls and overrides, and the Fire Alarm system control status priorities and overrides.

*6. Cabinet/Unit Heater Controls – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who furnishes the Cabinet/Unit Heaters; line voltage stand-alone controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring Cabinet/Unit Heater controls to be integrated into BMS. Refer to Section 230993 SEQUENCE OF OPERATIONS.

1.G Submittals

1. Shop Drawings, Product Data, and Samples

   a. The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.

   b. Submittals shall be in defined packages. Each package shall be complete, shall only reference itself, and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.

   c. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.

   d. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.

   e. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.

   f. The BMS Contractor shall correct any errors or omissions noted in the first review.

   g. At a minimum, submit the following:

      - BMS network architecture diagrams including all nodes and interconnections.
      - Systems schematics, sequences, and flow diagrams.
      - Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
      - Samples of Graphic Display screen types and associated menus.
      - Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
      - Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
      - Room Schedule including a separate line for each VAV box and/or terminal unit indicating location and address.
      - Control Valve Schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Design Pressure, and Actuator Type.
      - Details of all BMS interfaces and connections to the work of other trades.
      - Product data sheets or marked catalog pages including part number, photo and description for all products including software.

2. Existing Systems Inventory

    a. Where applicable, provide a complete and current BMS site inventory for all existing field and supervisory controllers to be integrated into the new BMS including manufacturer, model number, firmware version, available updates, battery condition, integrations, controlled equipment, and point counts.

    b. Site inventory shall be provided on a separate, new USB compatible flash drive.

1.H Record Documentation

1. Operation and Maintenance Manuals.

    a. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media or USB Flash Drive, and include the following for the BMS provided:

        - Table of contents.
        - As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
        - Manufacturer’s product data sheets or catalog pages for all products including software.
        - System Operator’s manuals.
        - Archive copy of all site-specific databases and sequences.
        - BMS network diagrams.
        - Interfaces to all third party products and work by other trades.

2. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server.

1.I Warranty

1. Standard Material and Labor Warranty:

    a. Provide a one-year labor and material warranty on the BMS.

    b. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.

    c. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor’s normal business hours.

Part 2 – Products

2.A General Description

1. The BMS shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third party devices and applications. The system shall be

designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

2. The BMS shall consist of the following:
    a. Network Engine(s)
    b. Field Equipment Controller(s)
    c. Input/Output Module(s)
    d. Local Display Device(s)
    e. Portable Operator's Terminal(s)
    f. Distributed User Interface(s)
    g. Network processing, data storage and communications equipment
    h. Other components required for a complete and working BMS
3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
    a. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
    b. The System shall maintain all settings and overrides through a system reboot.
5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.
6. The System shall comply with the following International Code Council (ICC) Codes:
    a. Building Officials and code Administrators International (BOMA) model code.
    b. International Conference of Building Officials (ICBO) model code.
    c. Southern Building Code Congress International (SBCCI) regulations.
7. Acceptable Manufacturers
    a. Johnson Controls, Metasys.
    b. Honeywell, Enterprise Building Integrator (EBI).

2.B BMS System Architecture

1. Automation Network
    a. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
    b. The BMS shall network multiple user interface clients, application and data servers, automation engines, system controllers and application-specific controllers including but not limited to:
        i. Network Automation Engines

ii. Network Integration Engines

iii. Network Control Engines

c. Select Field Equipment Controllers

d. Select VAV Modular Assemblies

e. Third Party BACnet controllers and peripheral devices with compatibility listed by BACnet International

f. Application and Data Server.

g. All BMS devices on the automation network shall be capable of operating at a minimum communication speed of 100 Mbps, with full peer-to-peer network communication.

h. Network Security – To protect the BMS from unauthorized users and computer hackers the Automation Network shall support HTTPS with TLS 1.2 between components, including the Application and Data Server(s), Network Engines, Mobile User Interface and Site Management Portal. Self-signed certificates are installed on supported products, with the option of configuring trusted certificates. Computing devices supplied by the BMS vendor will automatically shut down unused ports to deter unauthorized access.

i. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

2. Control Network

a. Network Engines (NAE) shall provide supervisory control over the control network and shall selectively support the following communication protocols:

i. BACnet Standard Master-Slave/Token-Passing (MS/TP) Bus Protocol ASHRAE SSPC-135:

a) The NAE shall be BTL certified and carry the BTL Label.

b) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).

ii. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).

iii. The Johnson Controls N2 Field Bus.

iv. Modbus® TCP and RTU.

b. Control networks shall provide either “Peer-to-Peer”, Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.

c. Control network shall support digital controllers as indicated in plans and specifications.

d. Default control network communication protocol for this project shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

e. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

f. The PICS shall be submitted 10 days prior to bidding.

3. Integration

a. Hardwired

i. Analog and digital signal values shall be passed from one system to another via hardwired connections.

ii. There will be one separate physical point on each system for each point to be integrated between the systems.

b. Direct Protocol (Integrator Panel)

i. The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and third party manufacturers' control panels. The BMS shall have the ability to receive, react to, and return information from multiple building systems, including but not limited to the chillers, boilers, variable frequency drives, power monitoring system, and medical gas.

ii. All data required by the application shall be mapped into the Automation Engine's database, and shall be transparent to the operator.

iii. Point inputs and outputs from the third party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and LAN Communications.

c. BACnet Protocol Integration – BACnet

i. The neutral protocol used between systems will be BACnet IP and comply with the ASHRAE BACnet standard 135.

ii. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.

iii. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.C User Interface

1. Dedicated Web Based User Interface

a. Where indicated on plans the BMS Contractor shall provide and install a personal computer for command entry, information management, network alarm management, and database management functions. Real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines and Data Server(s) to facilitate greater fault tolerance and reliability.

b. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.

i. Microsoft Internet Explorer 11.0 or Edge for user interface functions.

ii. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions.

iii. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports.

iv. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.

c. PC Hardware/Software – The personal computer(s) shall be configured as specified in the Computing Hardware and Software section.

d. Provide one operational device as herein specified and located on plans.

2. Mobile, Web Based, User Interface (MUI)

a. General

i. The mobile, web based, user interface shall be HTML5-compliant and provide device-agnostic access to the system from smartphones, tablets, portable and desktop computers. User Interfaces that require software installation on the client device (e.g. Java, MicrosoftSilverlight®, Adobe® Flash®), or software downloads from an online app store shall not be acceptable for these purposes.

ii. The mobile user interface shall provide system operators with a simple location-based navigation approach to finding information, including the ability to search for any location by name and to bookmark a location in a standard browser.

iii. The mobile user interface shall organize and display information using customer specific locations and spaces. At a minimum, the user interface shall provide:

- Organization of all space, equipment and point information in a familiar way (using standard equipment names and location descriptions), reducing the need for extensive training prior to use.
- A navigation mechanism or tree for users to select the specific location or space for accessing information – only spaces and locations in the navigation tree or equipment serving that space, nothing more.
- The ability to search for and/or bookmark any location, space, or equipment by name for quick access to critical or troublesome areas.
- Application of the same navigation mechanisms across any client device (e.g. Smart phone, tablet, personal computer) for consistency and ease of use.

iv. The same user interface elements shall be accessible from any type of personal computer or mobile device running any type of operating system supported (e.g. iOS, Android, Windows®). It shall automatically adapt and optimize the display for the screen size and touch screen navigation.

v. The user interface shall provide support for up to 50 concurrent users from individuals with defined access to the system.

b. Navigation Trees

i. A dedicated location based navigation tree shall be provided as part of the user interface in order to navigate to specific places within the facility on a hierarchical basis (typ. Facility, Building, Wing, Floor, Room.)

ii. The location-based tree shall use place names familiar to the operator without training or familiarization regarding special codes and conventions utilized in the generation of the BMS.

iii. Clicking or tapping on a location name in the tree shall display the home page associated with the space and simultaneously expand the tree to display the next level of spaces below the one selected.

iv. It shall be possible for qualified users to view a navigation tree of devices connected to the BMS network in order to enable troubleshooting of equipment and communications. Clicking or tapping on the Network Icon at the top of the Navigation Tree will access this alternate view. Users without the necessary access rights shall not see the Network Icon.

v. A click or tap on a device in the network tree shall display a dashboard for that device including information regarding related equipment and access to a separate focus view of commandable points associated with the piece of hardware. A click or tap on such a point shall display a control dialogue box allowing the user to modify or command that point as indicated. The dialog box shall contain an annotation box for describing why the action was taken or special circumstances that apply.

vi. Specific hardware and software types in the Network tree shall also include access to one or more the following views in their dashboard depending on hardware type or network element (e.g. MS/TP trunk):

- Summary View
- Diagnostic View
- Network View
- Trend View

vii. It shall be possible to hide the Network Tree and return to the Spaces Tree at any time by clicking on the Spaces Icon above the tree.

c. Dashboard Displays

i. The user interface shall provide the ability to view equipment visualizations, floor plans, and/or other graphics on mobile or desktop client devices in a browser environment, without the need for additional plugins or software. Graphics shall be accessible via a space (for floorplans, campus maps, etc.) or equipment dashboard.

ii. Users with appropriate permissions shall have access to a Dashboards Manager that can change the display order of Summaries and Data elements, add or remove elements and apply custom dashboards layouts to equipment and space by type.

iii. Dashboard Manager shall apply dashboards to spaces or equipment based on the viewing platform (Desktop/Tablet or Phone) in order to tailor the user experience to the needs of the specific user base.

iv. Default dashboard displays by space and equipment type shall be created per the guidelines in this specification or by mutual agreement with the owner’s representative.

d. Alarm Management

i. The user interface shall provide a single display of all potential issues in a facility including items currently in alarm, warning, override, out-of-service and offline.

ii. The user interface shall provide notification of new alarms, visually and audibly.

iii. The user interface shall provide the ability to view a summary of alarms, including a chart of the number of alarms in each of the defined alarm priority ranges. The priority ranges should be filterable.

iv. The user interface shall provide the capability to view multiple occurrences of the same alarm, ultimately providing the ability to acknowledge or discard all occurrences of the alarm in a single action.

v. The user interface shall provide the capability to view, and filter on, all alarms present in a well-defined mechanical system using the equipment serving equipment relationships.

vi. The user interface shall provide the capability to acknowledge and discard all occurrences of at least 1000 alarms in one operation.

vii. The user interface shall provide the user with the understanding of what physical space is being affected when an alarm occurs. The user interface shall provide the ability to filter alarms by physical space affected when the alarm occurred.

viii. The user interface shall provide the capability to monitor alarms 24/7 without requiring an active login to the system, accessible via segregated web page. The user interface shall provide the capability to enabled or disable the 24/7 alarm monitor mode if desired.

e. Equipment Activity Summary

i. The user interface shall provide a filterable, single display, of all activity related to a specific piece of equipment including user changes, discarded user changes, pending alarms, discarded alarms, and acknowledged alarms for at least one year of historical data.

ii. Items shall be listed in timed order with the latest activity at the top of the list.

iii. Filters shall allow only specific activities for specific data points occurring within a specific time and date window to be displayed.

iv. It shall be possible to export a .csv copy of the currently displayed summary by clicking or tapping on the export icon.

v. It shall be possible to create a custom trend graph containing the data shown in the currently displayed summary by tapping or clicking on the trend icon in the header bar and selecting the specific points to trend in the resulting selection panel.

vi. Clicking on the information icon in front of any displayed activity listed in the summary shall expand the display to include the name of the user, server time, value prior to the activity, the ability to annotate the activity and a user selectable icon for displaying a trend graph of the point.

f. Equipment Relationships Summary

i. The user interface shall provide a summary of all equipment and spaces related to the operation of the system or device currently selected for viewing.

ii. Include the capability to navigate to the home page of any related piece of equipment or space with a single click or tap on the desired element.

g. Equipment Data Summary

i. The user interface shall provide a summary of all data pertaining to a particular piece of mechanical or electrical equipment in a tabular format.

ii. Clicking or tapping on any value in the summary shall display a related command panel allowing the user to command, override, or change service condition of the point selected and to annotate such actions for future reference.

iii. It shall be possible to export a .pdf copy of the report with a single click on the associated export icon.

h. Equipment Serving Space Summary

i. The user interface shall provide a summary of all mechanical and electrical equipment as defined in the points list that serves a selected space from the navigation tree.

ii. The summary shall be capable of including a subset of the viewable points for each system representing the key elements of interest to operators without subjecting them to long lists of points irrelevant to basic operation.

iii. Clicking or tapping on any item in the summary shall navigate to the item's assigned home page in the user interface.

iv. It shall be possible to view a custom trend of information contained in the summary with a single click of the trend icon residing in the title header.

v. It shall be possible to display specific systems and points by filtering equipment types desired.

vi. Because the data is intended to be a snapshot of the current conditions in the space it shall not dynamically update but a click or tap on the update icon at any time performs that function.

i. Potential Problem Areas

i. The user interface shall provide a summary of all points in the system related to the space that are not operating correctly (e.g. alarm, off normal or not communicating correctly) in order to provide the operator with a quick update on current conditions.

ii. The information shall include:

- Point status (via color.)
- Point name.
- Value of the point when the summary was taken.
- Equipment that contains the offending point.
- Space that is served by that equipment.

iii. Data points in the summary may be filtered by one or more types of off-normal condition (e.g. above setpoint, offline and overridden).

iv. The summary may be exported in .csv format for inclusion in spreadsheets or other documents.

j. Equipment Summary

i. The user interface shall provide a summary that allows the user to compare all similar equipment that serves the space as well as downstream (child) spaces in order to evaluate conditions quickly and determine patterns for troubleshooting purposes.

ii. Each unique equipment type shall be selectable and display a representative set of values along with the space(s) being served by the device. Equipment types can be selected from a dropdown menu in the summary.

iii. Clicking or tapping on a selected device in the summary shall navigate to the home page for that piece of equipment while clicking or tapping a data point shall display the command panel for that point.

iv. It shall be possible to export a .pdf copy of the currently displayed summary by clicking or tapping on the export icon.

v. It shall be possible to create a custom trend graph containing the data shown in the currently displayed summary by clicking on the trend icon in the header bar and selecting the specific points to trend in the resulting selection panel.

k. User Defined Summaries

i. Provide the capability to view, command, and modify large quantities of similar data in summaries without the use of a secondary application (e.g. a spreadsheet). These summaries shall be generated automatically or user defined. User defined summaries shall allow up to seven user defined columns describing attributes to be displayed including custom column labels with up to 100 rows per summary.

l. Trend

i. The user interface shall provide the capability to view historical trend data from multiple pieces of equipment in both bar and line formats.

ii. The user shall have the ability to navigate to a selection list of frequently viewed trends.

iii. Trend graphs shall have to ability to be smartly auto-generated based on equipment and space relationships.

iv. Each graph shall include a dedicated selection icon to export a copy of the graphic and data in .pdf format or the data only as a .csv file.

m. Operator Access

i. The user interface shall provide the ability to segment access to building data based on the space(s) or location(s) the user is physically located in and/or manages. The user interface shall provide the capability to assign “inherited” space permissions and the ability to assign user’s space based access in bulk.

ii. The user interface shall provide the ability to segment access to building data based on the space(s) or location(s) the user is physically located in and/or manages. The user interface shall provide the capability to assign “inherited” space permissions and the ability to assign user’s space based access in bulk.

n. Graphics

i. The user interface shall display an equipment visualization or graphic within the context of its associated space (building, floor, room, etc.) or equipment dashboard.

ii. Graphics shall include the ability to define individual information layers for operator selection in order to clarify systems status and simplify operation on mobile devices. Where desired a master layer may be defined to include important information about the facility on all graphic screens.

iii. Graphics shall support the use of photo-realistic symbols as well as color change and animation to match the status of the related system control point.

iv. It shall be possible to export a time stamped .pdf file of the graphic being viewed in order to communicate the current conditions in the space or the equipment being viewed and to provide a historic record.

v. An integral graphic manager shall be provided including the following features and capabilities:

- Creation and modification of graphics from any HTML5 capable browser without the need for additional plug-ins or software packages.
- Access to a full suite of pre-defined templates for air and water sourced HVAC applications as well as the ability to add custom templates as created for other use. Pre-aliased graphic templates may be defined and saved for repetitive representations of common mechanical and electrical equipment.
- A full suite of pre-defined three dimensional symbols for mechanical and electrical systems as well as all line, text and shape tools required for integration into a graphic with zoom and pan capabilities on multiple platforms and in multiple browsers.
- The ability to search and replace items in multiple graphics with a single command.
- The ability to import and insert photos and images into the graphic.
- The ability of the graphics manager to create and edit graphics including the ability to bind graphic elements to the values and conditions of system points in both an on-line and off-line mode.

vi. As required, the BMS Contractor shall provide software licenses in the name of the owner for programming, configuration and graphics building tools to allow designated representatives to make changes, modifications or additions to the system. While future updates or revisions may require an update fee, the owner shall incur no additional cost if they choose not to update. Systems that require any annual or time-limited licensing fees shall not be permitted.

o. Scheduling

i. The user interface shall provide the capability to display, in a singular view, all of the effective schedules in the context of the space (building/floor/room, etc.) or equipment that the schedule effects. The software should have the ability to display an effective schedule, for the present, or a future date.

ii. The user interface shall provide a report of all schedules affecting a space or equipment. The report shall provide the user details of events that comprise the weekly schedule and exception schedule(s). The report shall provide a means of

viewing individual breakout scheduling elements for Weekly Schedule, Exceptions and Default Commands.

iii. The user interface shall provide the capability to efficiently change or modify schedules in mass quantities. This includes the capability to add, in bulk, exceptions to schedules, in addition to assigning, in bulk, weekly schedules.

p. Command and Control

i. It shall be possible to command system analog and binary points via a dropdown menu accessed by clicking or tapping on the value shown in any equipment summary or graphic display and completing the task in the resultant menu including an optional annotation.

ii. Commanding multiple points shall be possible on displays where multiple like system elements can be chosen.

q. Search

i. Typing a text string in the Search box shall display a list of all occurrences of that string in the mobile user interface. When a string is represented in the description of a space or network element, selecting it shall display its default dashboard.

ii. Clicking or tapping on the Advanced Search Icon shall display the Advanced Search dialog box permitting the following:

- Search by Space and Equipment, Equipment Definition or Network Reference.
- Filter the search by wildcard name or object type.
- Multi-selection of objects for commanding or the creation of reports including Trend, Alarm, Audit and Activity for a specific period of time.

r. Offline Operation

i. The mobile user interface shall have the ability to operate in an offline mode in order to create or edit graphics and dashboard elements.

ii. Content created offline shall be available to all authorized users for inclusion of an operating user interface later.

3. Site Management Portal and Associated Application Components

a. General – The Site Management Portal and its user interface shall serve as the primary tool for creation and maintenance of the BMS.

b. All features and functions of the Site Manager and associated user Interface defined in this document shall be available on any computer connected directly or via a WAN/VPN to the automation network and conforming to the following specifications.

c. The software shall run be accessible and operational on a Microsoft Internet Explorer (11.0 or higher) browser and support the following functions:

i. Configuration.

ii. Commissioning.

iii. Data Archiving.

iv. Monitoring.

v. Commanding.

vi. System Diagnostics.

d. Minimum hardware requirements for client devices:

i. 8GB RAM.

ii. 3.0 GHz Clock Speed Intel Microprocessor.

iii. 100 GB Hard Drive (free space for cut and paste/screen captures.)

iv. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth.

v. Mouse or other pointing device.

e. Operator Interface

i. An integrated browser based client application shall be provided as the user interface program for operators familiar with the detailed operation of the BMS and charged with the maintenance and optimization of the mechanical/electrical systems in the facility.

ii. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.

iii. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.

iv. The user interface software shall provide help menus and instructions for each operation and/or application.

v. The system shall support customization of the user interface configuration and a home page display for each operator.

vi. The system shall support user preferences in the following screen presentations:

- Alarm.
- Trend.
- Display.
- Applications.

vii. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.

viii. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

- User access for selective information retrieval and control command execution.
- Monitoring and reporting.
- Alarm, non-normal, and return to normal condition annunciation.
- Selective operator override and other control actions.
- Information archiving, manipulation, formatting, display and reporting.

- BMS internal performance supervision and diagnostics.
- On-line access to user HELP menus.
- On-line access to current BMS as-built records and documentation.
- Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications.

ix. The system shall support a list of application programs configured by the users that are called up by the following means:

- The Tools Menu.
- Hyperlinks within displays.
- Key sequences.

x. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

f. Navigation Trees

i. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum, provide a tree that identifies all systems on the networks.

ii. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.

iii. The navigation trees shall be “dockable” to other displays in the user interface. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

g. Alarms

i. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

- Log date and time of alarm occurrence.
- Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
- Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
- Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
- Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described

above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

- Configuration of which NAE offline alarms are seen by each user.
- Any attribute of any object in the system may be designated to report an alarm.

ii. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.

iii. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined .wav files.

iv. The BMS shall annunciate application alarms at minimum, as required by Part 3.

h. Reports and Summaries

i. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

- All points in the BMS.
- All points in each BMS application.
- All points in a specific controller.
- All points in a user-defined group of points.
- All points currently in alarm.
- All points locked out.
- All user defined and adjustable variables, schedules, interlocks and the like.

ii. Summaries and Reports shall be accessible via standard user interface functions and not dependent upon custom programming or user defined HTML pages.

iii. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.

iv. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

v. Provide a focused set of reports that includes essential information required for effective management of energy resources within the facility. Energy reports shall be configurable from predefined, preconfigured templates. Reports shall be selectable by date, time, area and device. Each report shall include a color visual summary of essential energy information. Required items:

- Energy Overview.
- Load Profile.
- Simple Energy Cost.
- Consumption.
- Equipment Runtime.

- Electrical Energy.
- Energy Production.

i. Schedules

i. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:

- Weekly schedules.
- Exception Schedules.
- Monthly calendars.

ii. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.

iii. It shall be possible to define one or more exception schedules for each schedule including references to calendars.

iv. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.

v. Changes to schedules made from the User Interface shall directly modify the schedule database stored in an engine or server.

vi. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.

vii. The Calendar object supports an option to add a reference to another Calendar Object that is designated to be the master for the facility. Any Supervisory and BAC calendars can be configured to reference a single master Global Calendar. Changes to the master global calendar are automatically synced with all calendars that are referenced.

viii. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

ix. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history.

j. Security/Passwords

i. Multiple-level passwords access protection shall be provided via roles and permissions. The feature will allow the system to base access on a user's job title or role and allow the user/manager access interface control, display, and database manipulation capabilities based on an assigned password.

ii. Roles may be copied and altered to meet specific roles and permissions based on the particular policies.

iii. Each user shall have the following: a user account name (with a maximum of 30 characters), a complex password or passphrase (with a min of 8 characters and a max of 50 characters), other user account policies (such as session timeout),

timesheet access based on day of the week and time of day, and specific user view.

iv. The system shall allow each user to change his or her password at will.

v. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

vi. A maximum of 150 categories may be used to determine or assign areas of responsibilities to each user account. A maximum of 13 (of the 150) named categories which are specifics such as “No Access, View, Advanced Review, Operate, Intervene, Diagnostic, Manage Item Events, Manage Every, and Configure Items”.

vii. A minimum of 100 unique passwords shall be supported.

viii. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

ix. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.

x. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

xi. The system shall have the ability to provide a Department of Defense (DoD) specific warning banner for applicable sites that warns the user they are accessing a restricted site.

xii. After successful login to the Site Management Portal (SMP) the last time and date that user name was previously logged in is shown on the screen.

xiii. Each login attempt is recorded in the system Audit Log with the option to record the IP address of the PC that made the login.

k. Screen Manager

i. The system will allow a customized image on the login screen (e.g. organization name, logo).

ii. User View navigations can be displayed as either a set of tabs or a drop down list.

iii. Allows user preference for assigning of a background color for when an object is Out of Service which will enable the operator to quickly distinguish points that have been commanded to this state.

iv. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

l. Historical trending and data collection

i. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:

- Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:
  a) Defined time interval
  b) Upon a change of value
- Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.

ii. The system shall provide a configurable data storage subsystem for the collection of historical data. Data can be stored in SQL database format.

iii. The system shall provide data to enable optimization capabilities including fault detection and diagnostics, advanced analytics and central plant optimization without the need of a gateway or additional hardware.

m. Trend data viewing and analysis

i. Provide a trend viewing utility that shall have access to all database points.

ii. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.

iii. The trend viewing utility shall have the capability to define trend study displays to include multiple trends.

iv. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.

v. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.

vi. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

vii. The Display shall support the user's ability to change colors, sample sizes, and types of markers.

n. Database Management

i. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.

ii. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.

iii. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

- Backup.
- Purge.
- Restore.

iv. The Database Manager shall support four tabs:

- Statistics – shall display Database Server information and Trend, Alarm (Event), and Audit information on the Databases.
- Maintenance – shall provide an easy method of purging records from the Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.
- Backup – Shall provide the means to create a database backup file and select a storage location.
- Restore – shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.

v. The Status Bar shall appear at the bottom of all Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:

- Ready.
- Purging Record from a database.
- Action Failed.
- Refreshing Statistics.
- Restoring database.
- Shrinking a database.
- Backing up a database.
- Resetting internet information Services.
- Starting the Device Manager.
- Shutting down the Device Manager.
- Action successful.

vi. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.

vii. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

viii. The Monitoring Settings window shall have the following sections:

- General – Shall allow the user to set and review scan intervals and start times.
- Email – Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.
- Warning – shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.
- Alarm – shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.
- Database login – Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the

Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.

ix. The Monitoring Settings Taskbar shall provide the following informational icons:

- Normal – Indicates by color and size that all databases are within their limits.
- Warning – Indicates by color and size that one or more databases have exceeded their Warning limit.
- Alarm – Indicates by color and size that one or more databases have exceeded their Alarm limit.

x. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit. Provide Site Management Portal with associated user interface at each Network Engine as well as all Application and Data Servers. Device Home Page: Each controller on the MS/TP Field Bus will include a home page that can be selected on the Device List page. The Device Home Page will show the relevant value and status information for the respective controller using consistent summary graphics that are derived from the equipment model and/or standard control applications libraries. The summary graphic will change to red if there is an alarm present for that controller. The Device Home Page will also show an alarm indication box for the highest priority alarm for that controller.

- Device Alarm Page: An Alarm Page shall allow the user to toggle between a list of Active Alarms or All Alarms. The Alarm Page shall be organized to automatically show the highest priority alarm indication for each connected device. The Alarm Page will display color differentiation of alarm priorities. The Alarm Page will provide an accordion pull-down view of reoccurring alarms, showing the date-time stamp of the alarms.
- Point View/ Edit Page: The Device Home Page shall provide a slide-over menu for each device, which will allow the user to select Point View/Edit Pages. The Point View/Edit Page will provide a scrolling list of all of the input and output points for each device, along with their respective software points. The Point View/Edit page will show the point name, status/reliability, and current value in the appropriate engineering units. An icon will appear for points that can be overridden or edited; clicking on the icon will open a point edit dialog screen. The point edit screen will show the pre-configured minimum and maximum limits; changing the point value can be done with a slider or mobile keyboard. Ex. For a VAV box controller, the technician can change temperature set points, change minimum and maximum velocity set point, display room temperature, and display duct velocity.

xi. Audit Log: Provides a log of user actions on MAP Gateway device that Administrators may download. The Audit Log will be stored in non-volatile memory so that it persists on device restarts. Audit Log messages will include data/time stamp, current user, current device name and address (commands only), and commanded value (commands only).

xii. Tailored Summary: Provides the ability to set up a custom summary tailored to the specific needs of the operator and the capabilities of the connected equipment. Tailored summaries can aggregate and display information from multiple controllers on a field bus.

xiii. Live Trend: Provides users with the ability to specify up to 3 points from a controller to trend in near real-time. The user shall have the ability to choose the sample interval and the total time covered in the display (x-axis). The system will create an appropriate y-axis automatically. Each trended variable shall be identified by unique color and symbol.

xiv. Airflow Balancing: The gateway shall provide a tool for VAV box commissioning and air balancing for controllers provided under this specification. Connectivity to the individual boxes will not require connection to each controller but rather a connection to a single device on the MS/TP network within WiFi range.

xv. Report Creation: It shall be possible to create reports that summarize system status and setpoints and to forward those reports to a central repository for the creation of as-built summaries or commissioning documents.

o. RS-485 connectivity and connections.

i. The MAP Gateway shall include an RS-485 Port configured as BACnet MS/TP Master. Communications with devices and field controllers shall be possible via the following modes; all of these connections will provide access to all controllers on the MS/TP Field Controller bus:

- Connecting to a Smart Equipment Controller through the Sensor-Actuator Bus (SA Bus) RJ12 jack.
- Connecting to a field controller through the field controller SA Bus RJ12 jack.
- Connecting to the SA Bus of the field controller from a network room sensor via the RJ12 jack on the network room sensor.
- Connecting directly to the field controller bus, using an RJ12 to Terminal Block adaptor.

ii. The MAP Gateway power may be supplied via the SA Bus, the field controller bus, or a micro USB port.

p. USB connection: The MAP Gateway shall include a USB Port to provide access to MAP web pages through the USB port for stationary user interface configurations or USB connected equipment:

i. The USB port will follow USB 2.0 Network Device Profile.

ii. Network Profile will have similar security requirements to Ethernet Port with fixed IP Ports but no AES Encryption.

q. Multi-Client access: The MAP Gateway shall provide multi-client connectivity for up to three (3) simultaneous users, and shall provide three (3) password protected User Roles with automatic LOGOUT after 30 minutes of inactivity.

r. Security: In order to provide greater security for the enterprise-wide BMS, the MAP Gateway shall provide a user interface for interacting with the BMS without connecting to the enterprise-wide BMS. The Wi-Fi Port shall provide WPA2 Security with AES 128 Bit Encryption:

i. AP Only Operation or Client Mode to connect to other Wi-Fi networks.

ii. The MAP Gateway shall provide a WiFi to Ethernet Pass-thru option; this option shall be disabled by default.

iii. The MAP Gateway shall provide an option to disable the built-in Wi-Fi; this option shall only be available when the Ethernet connection is enabled.

iv. When connected to an enterprise or BMS specific IT infrastructure, the MAP Gateway shall be designed and connected for use inside of a firewall.

v. The MAP Gateway shall provide Authentication/Authorization.

vi. The MAP Gateway shall be certified as penetration tested by a professional agency that specializes in penetration testing for IT appliances and devices.

s. Navigation: the MAP Gateway pages shall be derived from the respective HVAC equipment model and/or standard HVAC control application. The pages use and support HTML5 navigation practices, such as click to select, slide over/down.

t. Installation and status indicators:

i. The MAP Gateway shall be designed to work as a portable device or it may be permanently mounted on site.

ii. Portable: The MAP Gateway shall include a preconfigured, flexible coiled RJ-12 Cable to connect in the field directly to controllers or through wall mounted room sensors with an RJ-12 port. The MAP Gateway shall include a protective Rubber Bumper Guard and a Lanyard.

iii. Stationary: The MAP Gateway shall include a Stationary Mounting Cradle to install the device in a panel. RJ-12 Cable, and an auto-switching 90-230 VAC Power Supply.

iv. Status Indication: The MAP Gateway shall provide LED lights to indicate overall operating condition and status, communications for the MS/TP bus connection, communications via the Ethernet connection, and WiFi connection and signal strength.

u. MAP Gateway web page configuration and linking:

i. The MAP Gateway shall provide automatic BACnet MS/TP device detection and connection, and automatic web page configuration and point linking.

- Carrying case.
- Spare battery.
- External power supply/battery charger.

ii. Software:

- Portable operator terminals shall support all controllers within the system on a direct-connect communications basis.
- When used to access First or Second Tier controllers, the portable operator terminal shall utilize the standard operator workstation software, as previously defined.
- When used to access Application Specific Controllers, the portable operator terminal shall utilize either the standard operator workstation software, as previously defined, or controller-specific utility software.

iii. Proprietary Portable Terminal:

- Manufacturers providing proprietary portable terminals shall submit technical data sheets for the terminal and all associated software and hardware.

v. Provide Johnson Controls MAP Gateway or approved equal.

2.D Network Automation Engines

1. General

   a. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.

   b. Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.

   c. User Interface – Each NAE shall have the ability to deliver a web based User Interface using the Site Management Portal functionality previously described. All computers connected physically or virtually to the automation network shall have access to the web based user interface.

      i. The web based user interface software shall be embedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.

      ii. The NAE shall support a minimum of two (2) concurrent users.

      iii. The web-based user shall have the capability to access all system data through a single NAE.

      iv. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.

      v. Systems that require the user to address more than one NAE to access all system information are not acceptable.

      vi. The NAE shall have the capability of generating web based user interface graphics. The graphics capability shall be embedded in the NAE.

      vii. Systems that only support user interface graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.

      viii. The web based user interface shall support the following functions using a standard version of Microsoft Internet Explorer:

         - Configuration
         - Commissioning
         - Data Archiving
         - Monitoring
         - Commanding
         - System Diagnostics

      ix. Systems that require workstation software or modified web browsers for system queries are not acceptable.

      x. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

   d. Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control

processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.

e. Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.

f. User Authentication – The NAE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).

g. Password Security – Access to the embedded user interface shall require a password of 8 to 50 characters including a minimum of one lower case letter, one upper case letter, one number, and one special character. An alarm shall be generated after three unsuccessful attempts within 15 minutes and the user shall be denied access until permission is renewed by a system administrator.

h. Network Security – Communication between the NAE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.

i. Hardware Real Time Clock – The NAE shall include an integrated, hardware-Based, real-time clock.

j. Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.

k. Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

   i. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.

   ii. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

l. Certification – The NAE shall be listed by UL.

m. Controller network – The NAE shall selectively support the following communication protocols on the controller network:

n. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

- The NAE shall support Remote field bus integration via a BACnet IP to MS/TP router.
- The NAE shall be BTL certified and carry the BTL Label.
- The NAE shall be tested and certified as a BACnet Building Controller (B-BC).

- A BACnet Protocol Implementation Conformance Statement shall be provided for the NAE.
- The Conformance Statements shall be submitted 10 days prior to bidding.

iii. The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.

- All LonWorks controls devices shall be LonMark® certified.

2. Network Automation Engine – Standard
   a. The NAE shall support a minimum of:
      i. Fifty (50) BACnet Standard MS/TP controllers.
      ii. Sixty-four (64) LonWorks FTT10 Free Topology control devices.
      iii. Fifty (50) N2 control devices.
   b. The NAE shall include troubleshooting LED indicators to identify the following conditions:
      i. Power – On/Off.
      ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.
      iii. Ethernet Connection Speed – 10 Mbps/100 Mbps.
      iv. FC Bus – Normal Communications/No Field Communications.
      v. Peer Communication – Data Traffic between NAE Devices.
      vi. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.
      vii. Bat Fault – Battery Defective, Data Protection Battery Not Installed.
      viii. Fault – General Fault.
      ix. Modem RX – NAE Modem Receiving Data (as required).
      x. Modem TX – NAE Modem Transmitting Data (as required).
   c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals:
      i. USB port.
      ii. RS-232 serial data communication port.
      iii. RS-485 port.
      iv. Ethernet port.
   d. Provide Johnson Controls NAE-35XX or approved equal as indicated on plans.
3. Network Automation Engine – Large
   a. The NAE shall support a minimum of:
      i. One Hundred (100) BACnet Standard MS/TP controllers.
      ii. One Hundred Twenty Seven (127) LonWorks FTT10 Free Topology control devices.

iii. One Hundred (100) N2 control devices.

b. The NAE shall include troubleshooting LED indicators to identify the following conditions:

i. Power – On/Off.

ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.

iii. Ethernet Connection Speed – 10 Mbps/100 Mbps.

iv. FC Bus – Normal Communications/No Field Communications.

v. Peer Communication – Data Traffic between NAE Devices.

vi. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.

vii. Bat Fault – Battery Defective, Data Protection Battery Not Installed.

viii. Fault – General Fault.

ix. Modem RX – NAE Modem Receiving Data (as required).

x. Modem TX – NAE Modem Transmitting Data (as required).

c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

i. USB port.

ii. RS-232 serial data communication port.

iii. RS-485 port.

iv. Ethernet port.

d. Provide Johnson Controls NAE-45XX or approved equal as indicated on plans.

4. Network Automation Engine – Large, Dual Trunk

a. The NAE shall support a minimum of:

i. One Hundred (100) BACnet Standard MS/TP controllers per trunk (200 total).

ii. Two Hundred Fifty Five (255) LonWorks FTT10 Free Topology control devices.

iii. One Hundred (100) N2 control devices per trunk (200 total).

b. The NAE shall include troubleshooting LED indicators to identify the following conditions:

i. Power – On/Off.

ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.

iii. Ethernet Connection Speed – 10 Mbps/100 Mbps/1000 Mbps.

iv. FC Bus A – Normal Communications/No Field Communications.

v. FC Bus B – Normal Communications/No Field Communications.

vi. Peer Communication – Data Traffic between NAE Devices.

vii. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.

viii. Bat Fault – Battery Defective, Data Protection Battery Not Installed.

ix. 24 VAC – 24 VAC Present/Loss of 24 VAC.

x. Fault – General Fault.

xi. Modem RX – NAE Modem Receiving Data (as required).

xii. Modem TX – NAE Modem Transmitting Data (as required).

c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

i. Two (2) USB port.

ii. Two (2) RS-232 serial data communication port.

iii. Two (2) RS-485 port.

iv. One (1) Ethernet port.

d. Provide Johnson Controls NAE-55XX or approved equal as indicated on plans.

5. Network Automation Engine – High Security

a. The High Security Network Engine shall exhibit the same general capabilities as the Large, Dual Trunk Network Automation Engine but with embedded encryption technology to protect and secure the BMS at the endpoint. Supporting the following security enhancements:

i. Common Criteria Certified.

ii. Meets Federal Information Processing Standard (FIPS) 140-2 Security Level 2 specification for the use of a cryptographic module.

iii. Tamper-proof housing with alarm notification.

b. Provide Johnson Controls NAE-55xS or approved equal as indicated on plans.

6. Network Automation Engine – Large, Data Intense

a. The NAE shall be a hardened, Intel based computing platform running Windows Server 2012 R2 operating system with sufficient processor speed and memory to perform data intensive tasks associated with high point counts and/or high level trending, switching.

b. The NAE shall include troubleshooting indicators to identify the following conditions:

i. Power – On/Off.

ii. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic (per port).

c. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

i. Two (2) USB ports.

ii. Two (2) Ethernet ports.

d. Provide Johnson Controls NAE-85XX or approved equal as shown on the plans.

2.E Network Control Engines

1. Network Control Engines
    a. The Network Control Engine (NCE) shall be a fully user-programmable, supervisory controller. The NCE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
    b. The NCE shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points.
    c. Automation Network – The NCE shall reside on the automation network and shall support a subnet of 32 Field controllers.
    d. User Interface – Each NCE shall have the ability to deliver a web based user interface as previously described. All computers connected physically or virtually to the automation network shall have access to the web based user interface.
        i. The web based user interface software shall be embedded in the NCE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
        ii. The NCE shall support a minimum of two (2) concurrent users.
        iii. The NCE shall have the capability of generating web based user interface graphics. The graphics capability shall be embedded in the NCE.
        iv. Systems that only support user interface graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
        v. The web based user interface shall support the following functions using a standard version of Microsoft Internet Explorer:
            - Configuration
            - Commissioning
            - Data Archiving
            - Monitoring
            - Commanding
            - System Diagnostics
        vi. Systems that require workstation software or modified web browsers are not acceptable.
        vii. The NCE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
    e. User Authentication – The NCE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).
    f. Password Security – Access to the embedded user interface shall require a password of 8 to 50 characters including a minimum of one lower case letter, one upper case letter, one number, and one special character. An alarm shall be generated after three unsuccessful attempts within 15 minutes and the user shall be denied access until permission is renewed by a system administrator.

g. Network Security – Communication between the NCE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.

h. The NCE shall employ a finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

i. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only, shall not be acceptable.

j. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

k. The NCE shall support the following number and types of inputs and outputs:

   i. Ten Universal Inputs – shall be configured to monitor any of the following:

      - Analog Input, Voltage Mode
      - Analog Input, Current Mode
      - Analog Input, Resistive Mode
      - Binary Input, Dry Contact Maintained Mode
      - Binary Input, Pulse Counter Mode

   ii. Eight Binary Inputs – shall be configured to monitor either of the following:

      - Dry Contact Maintained Mode
      - Pulse Counter Mode

   iii. Four Analog Outputs – shall be configured to output either of the following:

      - Analog Output, Voltage Mode
      - Analog Output, Current Mode

   iv. Seven Binary Outputs – shall output the following:

      - 24 VAC Triac

   v. Four Configurable Outputs – shall be configured to output either of the following:

      - Analog Output, Voltage Mode
      - Binary Output, 24 VAC Triac Mode

l. The NCE shall have the ability to monitor and control a network of sensors and actuators over a SA Bus.

   i. The SA Bus shall be a MS/TP Bus supporting BACnet Standard protocol SSPC-135.

   ii. The SA Bus shall support a minimum of 10 devices.

   iii. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the NCE and the furthest connected device.

m. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.

n. The NCE shall support, but not be limited to, the following applications:

o. Chilled water/central plant optimization applications including but not limited to:

- Selection and sequencing of up to eight chillers of different sizes.
- Selection and sequencing of up to eight (each) primary and secondary chilled water pumps of varying pumping capacities.
- Selection and sequencing of up to eight condenser water pumps.
- Selection and sequencing of cooling towers and bypass valve, including single speed, multi-speed, and Vernier control.
- Selection and sequencing of up to four heat exchangers, of different capacities.
- A proven and documented central cooling plant optimization program that incorporates custom equipment efficiency profiles, without rewriting software code, in order to meet the building load using the least amount of energy as calculated.
- The use of advanced control algorithms that apply equipment specific parameters, including operational limits and efficiency profiles, in order to determine equipment start and runtime preferences.
- Identification of the most efficient equipment combination and automatic control of state and speed of all necessary equipment to balance runtime, optimize timing and sequencing and ensure the efficiency and stability of the central cooling plant.
- Control definition for the chiller plant in a single FAC, FEC, or NCE, as supported by available memory and point I/O, or capable of being split across multiple FACs, FECs, or NCEs.

iv. Central heating plant applications.

v. Lighting and electrical distribution.

vi. Built-up air handling units for special applications.

vii. Power generation and energy monitoring equipment.

viii. Interfaces to security and fire detection systems.

ix. The NCE shall support a Local Controller Display either as an integral part of the NCE or as a remote device communicating over the SA Bus.

i. The Display shall use a BACnet Standard SSPC-135 MS/TP protocol.

ii. The Display shall allow the user to view monitored points without logging into the system.

iii. The Display shall allow the user to view and change setpoints, modes of operation, and parameters.

iv. The Display shall provide password protection with user adjustable password timeout.

v. The Display shall be menu driven with separate paths for:

- Input/Output
- Parameter/Setpoint
- Overrides

vi. The Display shall use easy-to-read English text messages.

vii. The Display shall allow the user to select the points to be shown and in what order.

viii. The Display shall support a back lit LCD with adjustable contrast and brightens and automatic backlight brightening during user interaction.

ix. The display shall be a minimum of 4 lines and a minimum of 20 characters per line.

x. The Display shall have a keypad with no more than 6 keys.

xi. The Display shall be panel mountable.

p. The NCE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.

q. The NCE shall employ an industrial single board computer.

r. Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.

s. The NCE shall include an integrated, hardware-based, real-time clock.

t. The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.

u. The NCE shall provide removable, color coded, screw terminal blocks for 24 VAC power, communication bus and I/O point field wiring.

v. The NCE shall include troubleshooting LED indicators to identify the following conditions:

- Power
- Fault
- SA Bus
- FC Bus
- Modem TX
- Modem RX
- Battery Fault
- Ethernet
- 10 LNK
- 100 LNK
- Run
- Peer Com

w. Communications Ports – The NCE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

   i. USB port

   ii. RS-232 serial data communication port

   iii. RS-485 port

   iv. RJ-45 Ethernet port

   v. RJ-12 jack

x. The NCE shall support an optional internal modem with RJ-12 6-pin telephone line connector.

y. Diagnostics – The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.

z. Power Failure – In the event of the loss of normal power, The NCE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

   i. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.

   ii. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

aa. Certification – The NCE shall be listed by UL. File E107041, CCN PAZX, UL 916, Energy Management Equipment. FCC Compliant to CFR47, Part 15, Subpart B, Class A.

bb. Field Controller Bus – The NCE shall support the following selectable communication protocols on the optional Field Controller Bus:

   i. The NCE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

      - The NCE shall be BTL certified and carry the BTL Label.
      - The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
      - A BACnet Protocol Implementation Conformance Statement shall be provided for the NCE.
      - The Conformance Statements shall be submitted 10 days prior to bidding.
      - The NCE shall support a minimum of 32 control devices.

   ii. The NCE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10 on the Field Controller Bus (LonWorks Network).

      - All LonWorks controls devices shall be LonMark certified.

- The NCE shall support a minimum of 32 LonWorks enabled control devices.

iii. The NCE shall support the N2 devices on the Field Controller Bus (Johnson Controls N2 Bus).

cc. Provide Johnson Controls NCE25 or approved equal as shown on plans.

2.F Application and Data Servers

1. Application and Data Server

a. The Application and Data Server (ADS) shall be a hardware and software solution designed to manage the collection and presentation of large amounts of trend data, event messages, operator transactions, and system configuration data on the BMS.

b. The ADS shall act as site director for consolidating BMS information from Network Engines for integrated storage and presentation. The ADS shall not restrict access to the individual Network Engines ensuring optimal BMS accessibility in the event of individual component failure or a loss of communication.

c. The ADS shall act as a server for the following functionality as described in these specifications:

- Mobile user interface providing user friendly access to system information via site navigation by place or device.
- Site Management Portal functions and applications.
- System Configuration Tool controller configuration and programming.

d. Network Security – Communication between the NCE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.

e. The ADS shall be capable of supporting up to {5} simultaneous users via Web client access.

f. User Authentication – The NCE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).

g. Computer shall be configured as specified in the Computing Hardware and Software section of this specification.

h. Provide Johnson Controls ADS or approved equal.

2. Extended Application and Data Server

a. The Extended Application and Data Server shall manage the collection and presentation of large amounts of trend data, event messages, operator transactions, and system configuration data.

b. The ADS shall act as site director for consolidating BMS information from large number of Network Engines for integrated storage and presentation of data. The ADS shall not restrict access to the individual Network Engines ensuring optimal BMS accessibility in the event of individual component failure or communications loss.

c. The ADS shall act as a server for the following functionality as described in these specifications:

- Mobile user interface providing user friendly access to system information via site navigation by place or device.
- Site Management Portal functions and applications.
- System Configuration Tool controller configuration and programming.

d. Network Security – Communication between the NCE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.

e. The ADS shall be capable of supporting up to {25} simultaneous users via Web client access.

f. The ADS shall support the addition of optional software packages for advanced reporting and essential energy information. Where provided:

   i. An Advanced Reporting package shall provide historical and configuration data reporting capabilities in a user interface that is separate from the site management user interface, allowing authorized users to run reports for immediate review in a web browser including:

      - Configuration Setup Report.
      - System Behavior Report.
      - Trend Report – including statistical calculations and Mean Kinetic Temperature (MKT).
      - Trend Detail Report – including summary data.

   ii. The Energy Essentials package shall extend reporting capabilities to include prepackaged reports providing a high-level view of normalized energy use across the site:

      - Big Picture Energy
      - Consumption
      - Electrical Energy
      - Production
      - Simple Energy Cost
      - Load Profile
      - Equipment Runtime

g. Supported Web Client operating systems:

   i. Microsoft Windows 7, 8.1, 10 (Professional, Enterprise, Ultimate, Anniversary.)

   ii. Apple OS X 10.8, 10.9, 10.10, 10.11.

h. Supported Web Browsers:

   i. Microsoft Internet Explorer 11, Edge.

   ii. Apple Safari Ver. 10.0 or higher.

   iii. Google Chrome Ver. 49 or higher.

iv. User Authentication – The NCE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).

i. Computer shall be configured as specified in the Computing Hardware and Software section of this specification.

j. Provide Johnson Controls ADX-x or approved equal.

2.G DDC System Controllers

1. Advanced Application Field Equipment Controller

a. The Advanced Application Field Equipment Controller (FAC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.

i. The FAC shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

- The FAC shall be BTL certified and carry the BTL Label.
- The FAC shall be tested and certified as a BACnet Advanced Application Controller (B-AAC).
- A BACnet Protocol Implementation Conformance Statement shall be provided for the FAC.
- The Conformance Statement shall be submitted 10 days prior to bidding.

b. The FAC shall employ finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

c. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FAC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

d. The FAC shall include an integral real-time clock and support time-based tasks which enables these field controllers to monitor and control:

i. Schedules.

ii. Calendars.

iii. Alarms.

iv. Trends.

e. The FAC can continue time-based monitoring when offline for extended periods of time from a network.

f. The FAC can operate as a stand-alone controller in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.

g. The FAC shall include troubleshooting LED indicators to identify the following conditions (*dependent on connection option):

i. Power On.

ii. Power Off.

iii. Download or Startup in progress, not ready for normal operation.

iv. No Faults.

v. Device Fault.

vi. Field Controller Bus – Normal Data Transmission*.

vii. Field Controller Bus – No Data Transmission*.

viii. Field Controller Bus – No Communication*.

ix. SA Bus – Normal Data Transmission.

x. SA Bus – No Data Transmission.

xi. SA Bus – No Communication.

xii. Ethernet*.

h. The FAC shall accommodate the direct wiring of analog and binary I/O field points with the following minimum Analog to Digital (A/D) and Digital to Analog (D/A) conversion resolution.

i. Provide a minimum 15 bit A/D resolution for analog inputs.

ii. Provide a minimum 15 bit D/A resolution for analog outputs.

i. The FAC shall support the following types of inputs and outputs supplied in the amounts required for the specified applications:

i. Universal Inputs – shall be configured to monitor any of the following:

- Analog Input, Voltage Mode.
- Analog Input, Current Mode.
- Analog Input, Resistive Mode.
- Binary Input, Dry Contact Maintained Mode.
- Binary Input, Pulse Counter Mode.

ii. Binary Inputs – shall be configured to monitor either of the following:

- Dry Contact Maintained Mode.
- Pulse Counter Mode.

iii. Analog Outputs – shall be configured to output either of the following:

- Analog Output, Voltage Mode.
- Analog Output, Current Mode.

iv. Binary Outputs – shall output the following:

- Line-voltage relay outputs.
- 24 VAC Triac.

v. Configurable Outputs – shall be capable of the following:

- Analog Output, Voltage Mode.
- Binary Output Mode.

The FAC shall have the ability to reside on a Field Controller Bus (FC Bus).

i. The FC Bus shall be a MS/TP Bus supporting BACnet Standard protocol SSPC-135.

ii. The FC Bus shall support communications between the FACs and the NAE.

iii. The FC Bus shall also support Input/Output Module (IOM) communications with the FAC and with the NAE.

iv. The FC Bus shall support a minimum of 100 IOMs and FACs in any combination.

v. The FC Bus shall operate at a maximum distance of 15,000 Ft. between the FAC and the furthest connected device.

vi. The FAC shall have the ability to reside on the Automation Network with the following capabilities:

- The ability to communicate with Open Data Servers (BACnet listed OWS) and select NAEs.
- Support for BACnet Protocol Revision 12 (PR12) as well as BACnet IPv4.
- Support for Peer to Peer communications with other Controllers on the Automation Network.

j. **{Option – Automation Network}** The FAC shall have the ability to monitor and control a network of sensors and actuators over a SA Bus.

i. The SA Bus shall be a MS/TP Bus supporting BACnet Standard Protocol SSPC-135.

ii. The SA Bus shall support a minimum of 10 devices per trunk.

iii. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FAC and the furthest connected device.

k. The FAC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the an MS/TP Bus.

- the efficiency and stability of the central cooling plant.
- Control definition for the chiller plant in a single FAC, FEC, or NCE, as supported by available memory and point I/O, or capable of being split across multiple FACs, FECs, or NCEs.

iv. Heating central plant applications.

v. Built-up air handling units for special applications.

vi. Terminal & package units.

2. Field Equipment Controller

a. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol or optionally via N2Open.

i. The FEC shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

- The FEC shall be BTL certified and carry the BTL Label.

- The FEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
- A BACnet Protocol Implementation Conformance Statement shall be provided for the FEC.
- The Conformance Statement shall be submitted 10 days prior to bidding.

b. The FEC shall employ finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

c. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

d. The FEC shall include troubleshooting LED indicators to identify the following conditions:

i. Power On.

ii. Power Off.

iii. Download or Startup in progress, not ready for normal operation.

iv. No Faults.

v. Device Fault.

vi. Field Controller Bus – Normal Data Transmission.

vii. Field Controller Bus – No Data Transmission.

viii. Field Controller Bus – No Communication.

ix. SA Bus – Normal Data Transmission.

x. SA Bus – No Data Transmission.

xi. SA Bus – No Communication.

e. The FEC shall accommodate the direct wiring of analog and binary I/O field points with the following minimum A/D and D/A conversion resolution.

i. Provide a minimum 15 bit A/D resolution for analog inputs.

ii. Provide a minimum 15 bit D/A resolution for analog outputs.

f. The FEC shall support the following types of inputs and outputs:

i. Universal Inputs – shall be configured to monitor any of the following:

- Analog Input, Voltage Mode.
- Analog Input, Current Mode.
- Analog Input, Resistive Mode.
- Binary Input, Dry Contact Maintained Mode.
- Binary Input, Pulse Counter Mode.

ii. Binary Inputs – shall be configured to monitor either of the following:

- Dry Contact Maintained Mode.
- Pulse Counter Mode.

g. The FEC shall have the ability to monitor and control a network of sensors and actuators over a SA Bus.

i. The SA Bus shall be a MS/TP Bus supporting BACnet Standard Protocol SSPC-135.

ii. The SA Bus shall support a minimum of 10 devices per trunk.

iii. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.

h. The FEC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.

i. The FEC shall support, but not be limited to, the following applications. Heating central plant applications.

iv. Built-up air handling units for special applications.

v. Terminal & package units.

vi. Special programs as required for systems control.

vii. The FEC shall support a Local Controller Display either as an integral part of the FEC or as a remote device communicating over the SA Bus.

i. The Display shall use a BACnet Standard SSPC-135 MS/TP protocol.

ii. The Display shall allow the user to view monitored points without logging into the system.

iii. The Display shall allow the user to view and change setpoints, modes of operation, and parameters.

iv. The Display shall provide password protection with user adjustable password timeout.

v. The Display shall be menu driven with separate paths for:

- Input/Output.
- Parameter/Setpoint.
- Overrides.

vi. The Display shall use easy-to-read English text messages.

vii. The Display shall allow the user to select the points to be shown and in what order.

viii. The Display shall support a back lit LCD with adjustable contrast and brightens and automatic backlight brightening during user interaction.

ix. The display shall be a minimum of 4 lines and a minimum of 20 characters per line.

x. The Display shall have a keypad with no more than 6 keys.

xi. The Display shall be panel mountable.

j. Provide Johnson Controls FEC or approved equal as shown on plans.

2.H Field Devices

k. Provide Johnson Controls VMAxx or approved equal as shown on plans.

3. VAV Modular Assembly

a. The VAV Modular Assembly (VMA) shall provide both standalone and networked DDC of pressure-independent, VAV terminal units. It shall address both single and dual duct applications.

b. The VMA shall be BTL certified and carry the BTL Label.

i. The VMA shall be tested and certified as a BACnet Application Specific Controller (B-ASC).

ii. A BACnet Protocol Implementation Conformance Statement shall be provided for the VMA.

iii. The Conformance Statement shall be submitted 10 days prior to bidding.

c. The VAV Modular Assembly shall communicate over the Field Controller Bus using BACnet Standard protocol SSPC-135.

d. The VAV Modular Assembly shall have internal electrical isolation for AC power, DC inputs, and MS/TP communications as provided. An externally mounted isolation transformer shall not be acceptable.

e. The VAV Modular Assembly shall be a configurable digital controller with integral differential pressure transducer and damper actuator. All components shall be connected and mounted as a single assembly that can be removed as one piece. Alternate configurations shall be available as follows:

i. A configurable digital controller with integral differential pressure transducer but without a damper actuator – for controlling large VAV boxes that require high torque.

ii. A configurable digital controller with an integral damper actuator but without a differential pressure transducer –for commercial zoning applications or for pressure-dependent VAV box applications.

iii. A configurable digital controller with an integral damper actuator and ball valve linkage but without a differential pressure transducer –for chilled beam applications.

f. The VAV Modular Assembly shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB or the controller is designed and suitable for use in other environmental air space (plenums) in accordance with Section 300.252(C) of the National Electrical Code.

g. The integral damper actuator shall be a fast response stepper motor capable of stroking 90 degrees in 60 seconds for quick damper positioning to speed commissioning and troubleshooting tasks.

h. The controller shall determine airflow by a state-of-the-art digital non-flow pressure sensor to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections; this pressure sensor eliminates high- and low-pressure connection mistakes.

i. Each controller shall have the ability to automatically calibrate the flow sensor to eliminate pressure transducer offset error due to ambient temperature / humidity effects.

j. The controller shall utilize a proportional plus integration (PI) algorithm for the space temperature control loops.

k. Each controller shall continuously, adaptively tune the control algorithms to improve control and controller reliability through reduced actuator duty cycle. In addition, this tuning reduces commissioning costs, and eliminates the maintenance costs of manually re-tuning loops to compensate for seasonal or other load changes.

l. The controller shall provide the ability to download and upload VMA configuration files, both locally and via the communications network. Controllers shall be able to be loaded individually or as a group.

m. Control setpoint changes initiated over the network shall be written to VMA non-volatile memory to prevent loss of setpoint changes and to provide consistent operation in the event of communication failure.

n. The controller firmware shall be flash-upgradeable remotely via the communications bus to minimize costs of feature enhancements.

o. The controller shall provide fail-soft operation if the airflow signal becomes unreliable, by automatically reverting to a pressure-dependent control mode.

p. The controller shall interface with balancer tools that allow automatic recalculation of box flow pickup gain (“K” factor), and the ability to directly command the airflow control loop to the box minimum and maximum airflow setpoints.

q. Controller shall have on-board diagnostics. These diagnostics shall consist of control loop performance measurements executing at each control loop’s sample interval, which may be used to continuously monitor and document system performance. The VMA shall calculate Exponentially Weighted Moving Averages (EWMA) for each of the following. These metrics shall be available to the end user for efficient management of the VAV terminals.

    i. Absolute temperature loop error.

    ii. Signed temperature loop error.

    iii. Absolute airflow loop error.

    iv. Signed airflow loop error.

    v. Average damper actuator duty cycle.

r. The controller shall detect system error conditions to assist in managing the VAV zones. The error conditions shall consist of:

    i. Unreliable space temperature sensor.

    ii. Unreliable differential pressure sensor.

    iii. Starved box.

    iv. Actuator stall.

    v. Insufficient cooling.

    vi. Insufficient heating.

s. The controller shall provide a flow test function to view damper position vs. flow in a graphical format. The information would alert the user to check damper position. The VMA would also provide a method to calculate actuator duty cycle as an indicator of damper actuator runtime.

t. The controller shall provide a compliant interface for ASHRAE Standard 62-1989 (indoor air quality), and shall be capable of resetting the box minimum airflow based on the percent of outdoor air in the primary air stream.

u. The controller shall comply with ASHRAE Standard 90.1 (energy efficiency) by preventing simultaneous heating and cooling, and where the control strategy requires reset of airflow while in reheat, by modulating the box reheat device fully open prior to increasing the airflow in the heating sequence.

v. Inputs:

   i. Analog inputs with user-defined ranges shall monitor the following analog signals, without the addition of equipment outside the terminal controller cabinet:

      - 0-10 VDC Sensors.
      - 1000ohm RTDs.
      - NTC Thermistors.
      - The AVMA shall provide minimum 15 bit A/D resolution for analog inputs.

   ii. Binary inputs shall monitor dry contact closures. Input shall provide filtering to eliminate false signals resulting from input “bouncing.”

   iii. For noise immunity, the inputs shall be internally isolated from power, communications, and output circuits.

   iv. Provide side loop application for humidity control.

w. Outputs

   i. Analog outputs shall provide the following control outputs:

      - 0-10 VDC

   ii. The AVMA shall provide minimum 15 bit D/A resolution of analog outputs

   iii. Binary outputs shall provide a SPST Triac output rated for 500mA at 24 VAC.

   iv. For noise immunity, the outputs shall be internally isolated from power, communications, and other output circuits.

x. Application Configuration

   i. The VAV Modular Assembly shall be configured with a software tool that provides a simple Question/Answer format for developing applications and downloading.

y. Sensor Support

   i. The VMA shall communicate over the SA Bus with a Network Sensor.

   ii. The VMA shall support an LCD display room sensor.

   iii. The VMA shall also support standard room sensors as defined by analog input requirements.

iv. The VMA shall support humidity sensors defined by the AI side loop.

z. Provide Johnson Controls VMAxx or approved equal as shown on plans.

4. Input/Output Module

a. The Input/Output Module (IOM) provides additional inputs and outputs for use in digital controllers.

b. The IOM shall communicate with controllers over the FC Bus or the SA Bus.

c. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

i. The IOM shall be BTL certified and carry the BTL Label.

ii. The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).

iii. A BACnet Protocol Implementation Conformance Statement shall be provided for the IOM.

iv. The Conformance Statement shall be submitted 10 days prior to bidding.

d. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

e. The IOM shall have a minimum of 4 points to a maximum of 17 points.

f. The IOM shall support the following types of inputs and outputs:

i. Universal Inputs – shall be configured to monitor any of the following:

- Analog Input, Voltage Mode.
- Analog Input, Current Mode.
- Analog Input, Resistive Mode.
- The IOM shall provide minimum 15 bit A/D resolution of analog inputs.
- Binary Input, Dry Contact Maintained Mode.
- Binary Input, Pulse Counter Mode.

ii. Binary Inputs – shall be configured to monitor either of the following:

- Dry Contact Maintained Mode.
- Pulse Counter Mode.

iii. Analog Outputs – shall be configured to output either of the following:

- Analog Output, Voltage Mode.
- Analog Output, current Mode.
- The IOM shall provide minimum 15 bit D/A resolution of analog outputs.

iv. Binary Outputs – shall output the following:

- 24 VAC Triac.

v. Configurable Outputs – shall be capable of the following:

- Analog Output, Voltage Mode.
- Binary Output Mode.

g. The IOM shall include troubleshooting LED indicators to identify the following conditions:
   i. Power On.
   ii. Power Off.
   iii. Download or Startup in progress, not ready for normal operation.
   iv. No Faults.
   v. Device Fault.
   vi. Normal Data Transmission.
   vii. No Data Transmission.
   viii. No Communication.

h. Provide Johnson Controls IOM or approved equal as shown on plans.

5. Network Thermostat – Fan Coil and Zoning
   a. The network thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV System, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.
   b. The Networked Thermostat shall communicate over the FC Bus using BACnet Standard protocol SSPC-135 or Johnson Controls N2 protocol.
      i. Communications shall be selectable locally at thermostat through the display.
   c. The TEC shall be BTL certified and carry the BTL Label.
      i. The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
      ii. A BACnet Protocol Implementation Conformance Statement shall be provided for the TEC.
      iii. The Conformance Statement shall be submitted 10 days prior to bidding.
   d. The network thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.
      i. Home screen configurable icons include:
         - On/Off icon.
         - Fan override icon.
         - Zone temperature icon.
         - Hold temperature icon.
      ii. Home screen non-configurable icon includes:
         - Menu icon.
   e. The network thermostat shall provide the flexibility to support any one of the following inputs:
      i. Integral indoor air temperature sensor.

ii. Analog input for remote air temperature sensing that supports the following sensor types.

- Nickel.
- Platinum.
- A99B PENN.
- 2.25k ohm NTC.
- 10k ohm NTC.
- 10k ohm NTC Type 3.

iii. Universal input that supports the following configurations:

- Analog sensor.
- Cooling when switch is closed.
- Heating when switch is closed.

iv. Remote indoor air temperature sensor.

v. Two configurable binary inputs with the following configurations:

f. The network thermostat shall provide 4 digit passcode security.

g. The network thermostat shall employ nonvolatile EEPROM for all adjustable parameters.

h. The network thermostat shall have a temperature accuracy of ±0.9°F/±0.5°C at 70.0°F/21.0°C typical calibrated.

i. The network thermostat shall have a humidity accuracy of ±5% RH from 20 to 80% RH at 50 to 90°F (10 to 32°C.)

j. The network thermostat shall provide user equipment visibility from a mobile device through the MAP.

k. On/off or floating fan coil and zoning applications:

i. The network thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV System, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.

ii. The network thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

iii. The network thermostat shall provide the flexibility to support any one of the following valve outputs:

- Two on/off.
- Two floating.

iv. The network thermostat shall provide the flexibility to adjust the following control parameters:

6. Network Thermostat – RTU/heat pump with economizer

a. The network thermostat shall be capable of controlling the following types of split or packaged units:
    - Cooling only units.
    - Cooling units with gas or electric heat.
    - Heat pumps.
    - Units with economizers.

b. The Networked Thermostat shall communicate over the FC Bus using BACnet Standard protocol SSPC-135 or Johnson Controls N2 protocol.
    i. Communications shall be selectable locally at thermostat through the display.

c. The TEC shall be BTL certified and carry the BTL Label.
    i. The TEC shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
    ii. A BACnet Protocol Implementation Conformance Statement shall be submitted for the TEC.
    iii. The Conformance Statement shall be submitted 10 days prior to bidding.

d. The network thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.
    iv. Home screen non-configurable icon includes: Menu icon.

e. The network thermostat shall provide the flexibility to support any one of the following inputs:
    i. Integral indoor air temperature sensor.
    ii. Analog input for remote air temperature sensing that supports the following sensor types:
        - Nickel.
        - Platinum.
        - A99B PENN.
        - 2.25k ohm NTC.
        - 10k ohm NTC.
        - 10k ohm NTC Type 3.
    iii. Remote indoor air temperature sensor.
    iv. Analog input for outdoor air temperature sensor.
    v. Analog input for remote temperature monitoring.
    vi. Two configurable binary inputs with the following configurations:
        - Disabled.
        - Occupancy.
        - Override.
        - Remote PIR.
        - Dirty filter.

- Service.
- Fan Lock.
- Open door.
- Open window.

f. The network thermostat shall provide the flexibility to support any one of the following outputs:

i. Up to two cooling/heating stages.

ii. The network thermostat shall provide 4 digit passcode security.

g. The network thermostat shall provide the flexibility to adjust the following control parameters:

h. The network thermostat shall employ nonvolatile electrically EEPROM for all adjustable parameters.

i. The network thermostat shall have a temperature accuracy of ±0.9°F/±0.5°C at 70.0°F/21.0°C typical calibrated.

j. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral Passive Infra-Red (PIR) occupancy sensor model.

k. The network thermostat shall provide user equipment visibility from a mobile device through the MAP.

l. Provide Johnson Controls TEC363x or approved equal as indicated on plans.

7. Standalone Thermostat – Fan Coil and Zoning

a. The standalone thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV system, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.

b. The standalone thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.

i. Home screen configurable icons include:

- On/Off icon, Fan override icon.
- Zone/Hold temperature icon.
- Zone humidity (on applicable models) icon.
- Occupancy status (on applicable models) icon.
- Temperature setpoint icon.
- Alarm/Unit status/Date and Time and Fan Override icon.
- Home screen non-configurable icon includes: Menu icon.

c. The standalone thermostat shall provide the flexibility to support any one of the following inputs:

i. Integral indoor air temperature sensor.

ii. Analog input for remote air temperature sensing that supports the following sensor types:

- Nickel.
- Platinum.
- A99B PENN.
- 2.25k ohm NTC.
- 10k ohm NTC.
- 10k ohm NTC Type 3.

iii. Universal input that supports the following configurations.

- Analog sensor.
- Cooling/heating when switch is closed.

iv. Remote indoor air temperature sensor

v. Two configurable binary inputs with the following configurations.

- Disabled, Occupancy, Override Dirty filter, Service, Fan lock open door/window

d. The standalone thermostat shall provide 4 digit passcode security.

e. The standalone thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

f. The standalone thermostat shall have a temperature accuracy of ±0.9F°/±0.5C° at 70.0°F/21.0°C typical calibrated.

g. The standalone thermostat shall have a humidity accuracy of ±5% RH from 20 to 80% RH at 50 to 90°F (10 to 32°C.)

h. On/Off or Floating fan coil and zoning applications.

i. The standalone thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

ii. The standalone thermostat shall provide the flexibility to support any one of the following valve outputs:

- Two on/off and two floating

iii. The standalone thermostat shall provide the flexibility to adjust the following control parameters:

i. Proportional fan coil and zoning applications

i. The standalone thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

ii. The standalone thermostat shall provide the flexibility to support the following valve outputs:

- Two proportional configurable from 0 to 10V.

iii. The standalone thermostat shall provide the flexibility to adjust the following control parameters:

j. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral Passive Infra-Red (PIR) occupancy sensor with a field of 94 angular degrees up to a distance of 15 ft., clear line of sight.

k. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral relative humidity sensor.

8. Standalone Thermostat – RTU/heat pump with economizer

a. The standalone thermostat shall be capable of controlling the following types of split or packaged units:

- Cooling only units.
- Cooling only units with gas or electric heat.
- Heat pumps.
- Units with economizers.

b. The standalone thermostat shall include a 4.2 inch LED backlit touch screen with the following configurable icons.

iv. Home screen non-configurable icon includes:

- Menu icon.

c. The standalone thermostat shall provide the flexibility to support any one of the following inputs:

i. Integral indoor air temperature sensor.

ii. Analog input for remote air temperature sensing that supports the following sensor types:

- Nickel.
- Platinum.
- A99B PENN.
- 2.25k ohm NTC.
- 10k ohm NTC.
- 10k ohm NTC Type 3.

iii. Remote indoor air temperature sensor.

iv. Analog input for outdoor air temperature sensor.

v. Analog input for remote temperature monitoring.

vi. Two configurable binary inputs.

d. The standalone thermostat shall provide the flexibility to support the following outputs:

i. Up to two cooling/heating stages.

e. The standalone thermostat shall provide 4 digit passcode security.

f. The standalone thermostat shall provide the flexibility to adjust the following control parameters:

i. Adjustable compressor minimum on time from 0 to 360 seconds.

g. Where required by application and indicated on plans or room schedules provide the standalone thermostat with an integral Passive Infra-Red (PIR) occupancy sensor model.

h. The standalone thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

i. The standalone thermostat shall have a temperature accuracy of ±0.9°F/±0.5°C at 70.0°F/21.0°C typical calibrated.

j. Proportional fan coil and zoning applications.

i. The network thermostat shall be capable of controlling two- or four-pipe fan coils, cabinet unit heaters, a pressure dependent VAV system, zoning type systems employing reheat including local hydronic reheat valves, or other similar equipment.

ii. The network thermostat shall provide the flexibility to support any one of the following fan outputs:

- Three speed fan control.
- Proportional speed fan control configurable from 0 to 10V.

iii. The network thermostat shall provide the flexibility to support the following valve outputs:

- Two proportional configurable from 0 to 10V.

iv. The network thermostat shall provide the flexibility to adjust the following control parameters:

- Adjustable maximum setpoint offset from 0 to 20°F.
- Adjustable fan on delay from 0 to 120 seconds.

k. Provide Johnson Controls TEC362x or approved equal where indicated on plans.

l. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral Passive Infra-Red (PIR) occupancy sensor.

m. Where required by application and indicated on plans or room schedules provide the network thermostat with an integral relative humidity sensor.

9. Network Sensors

a. The Network Sensors (NS) shall have the ability to monitor the following variables as required by the systems sequence of operations:

i. Zone Temp, Humidity, Setpoint, Disharge air temp and CO2

ii. The NS shall transmit the information back to the controller on the SA Bus using BACnet Standard protocol SSPC-135.

b. The NS shall be BTL certified and carry the BTL Label.

i. The NS shall be tested and certified as a BACnet Smart Sensors (B-SS).

ii. A BACnet Protocol Implementation Conformance Statement shall be provided for the NS.

iii. The Conformance Statement shall be submitted 10 days prior to bidding.

c. The Network Zone Temperature Sensors shall include the following items:

i. A backlit LCD to indicate the temperature, humidity and setpoint.

ii. An LED to indicate the status of the Override feature.

iii. A button to toggle the temperature display between Fahrenheit and Celsius.

iv. A button to program the display for temperature or humidity.

v. A button to initiate a timed override command.

vi. Available in either surface mount, wall mount, or flush mount.

vii. Available with either screw terminals or phone jack.

d. The Network Discharge Air Sensors shall include the following:

i. 4 inch or 8 inch duct insertion probe.

ii. Ten foot pigtail lead.

iii. Dip Switches for programmable address selection.

iv. Ability to provide an averaging temperature from multiple locations.

v. Ability to provide a selectable temperature from multiple locations.

e. The Network CO_2 Zone Sensors shall include the following:

i. Available in either surface mount or wall mount.

ii. Available with screw terminals or phone jack.

iii. Measurement range of 0-2000 ppm

iv. Sensing resolution of 1 ppm.

v. Sensing accuracy of +/- 2% of the reading plus 40 ppm.

f. Provide Johnson Controls ZFR coordinators and routers, with WRZ sensors, or approved equals, as shown on plans.

i. The Receiver shall use direct sequence spread spectrum RF technology.

ii. The Receiver shall operate on the 2.4 GHZ ISM Band.

iii. The Receiver shall meet the IEEE 802.15.4 standard for low power, low duty-cycle RF transmitting systems.

iv. The Receiver shall be FCC compliant to CFR Part 15 subpart B Class A.

v. The Receiver shall operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.

vi. The Receiver shall be capable of communication with from one to five WRZ sensors up to a distance of 200 Feet.

vii. The Receiver shall be assembled in a plenum rated plastic housing with flammability rated to UL94-5VB.

viii. The Receiver shall have LED indicators to provide information regarding the following conditions:

- Power.
- SA Bus – Receiver Activity/No Activity.

g. The Sensors shall sense and report room temperatures to the WRZ Receiver.

i. The sensors shall use direct sequence spread spectrum RF technology.

ii. The sensors shall operate on the 2.4 GHZ ISM Band.

iii. The sensors shall meet the IEEE 802.15.4 standard for low-power, low duty-cycle RF transmitting systems.

iv. The sensors shall be FCC compliant to CFR Part 15 subpart B Class A.

v. The sensors shall be available with:

- Warmer/cooler setpoint adjustment.
- No setpoint adjustment.
- Setpoint adjustment scale – 55 to 85°F.

vi. The sensors shall be assembled in NEMA 1 plastic housings.

h. Provide Johnson Controls WRZ series Receivers and Sensors, or approved equals, as shown on plans.

i. The Receiver shall use direct sequence spread spectrum RF technology.

ii. The Receiver shall operate on the 2.4 GHZ ISM Band.

iii. The Receiver shall meet the IEEE 802.15.4 standard for low power, low duty-cycle RF transmitting systems.

iv. The Receiver shall be FCC compliant to CFR Part 15 subpart B Class A.

v. The Receiver shall operate as a bidirectional transceiver with the sensors to confirm and synchronize data transmission.

vi. The Receiver shall be capable of communication with WRS Sensors up to a distance of 200 Feet (unobstructed).

vii. The Receiver shall be assembled in a plenum rated plastic housing with flammability rated to UL94-5VB.

viii. The Receiver shall have LED indicators to provide information regarding the following conditions:

- Power On/Off.
- Ethernet – Receiver Activity/No Activity.
- Ethernet Connection – No connection/10Mbps connection/100Mbps connection.
- Network Activity – No Network Activity/Half-Duplex Communication/Full-Duplex Communication.

i. The sensors shall sense and report room temperatures to the Receiver.

i. The sensors shall use direct sequence spread spectrum RF technology.

ii. The sensors shall operate on the 2.4 GHZ ISM Band.

iii. The sensors shall meet the IEEE 802.15.4 standard for low power, low duty-cycle RF transmitting systems.

iv. The sensors shall be FCC compliant to CFR Part 15 subpart B Class A.

v. The sensors shall be available with:

- Warmer/cooler setpoint adjustment.
- No setpoint adjustment.
- Setpoint adjustment scale – 55 to 85°F.

vi. The sensors shall be assembled in NEMA 1 plastic housings.

j. Provide Johnson Controls WRS series Receivers and Sensors or approved equal as indicated on plans.

2.I System Tools

1. System Configuration Tool

a. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE) or a Network Integration Engine (NIE).

b. The configuration tool shall provide an archive database for the configuration and application data.

c. The configuration tool shall have the same look-and-feel at the Site Management Portal user interface regardless of whether device configuration is being done online or offline.

d. The configuration tool shall include the following features:

i. Basic system navigation tree for connected networks.

ii. Integration of Johnson Controls N1, LonWorks, and BACnet enabled devices.

iii. Customized user navigation trees.

iv. Point naming operating parameter setting.

v. Graphic diagram configuration.

vi. Alarm and event message routing.

vii. Graphical logic connector tool for custom programming.

viii. Downloading, uploading, and archiving databases.

e. The configuration tool shall provide a site discovery feature to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:

i. BACnet Devices.

ii. LonWorks devices.

iii. Johnson Controls N2 Bus devices.

iv. Johnson Controls Metasys N1 networks.

f. The configuration tool shall be capable of programming the Field Equipment Controllers.

i. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.

ii. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.

iii. The configuration tool shall contain a library of standard applications to be used for configuration.

g. The configuration tool shall be capable of programming the field devices.

iv. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.

v. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.

vi. The configuration tool shall contain a library of standard applications to be used for configuration. Provide Johnson Controls SCT or approved equal.

2.J Computing Hardware and Software

1. General

a. Computing hardware, software and operating systems shall be provided at the revision level or model number as specified or at the latest release of the vendor if not specified.

b. In order to provide a consistent level of performance, all PCs shall be provided with Operating Systems and Processors by the manufacturer specified.

2. Dedicated Web Based User Interface

a. PC Hardware – The personal computer(s) shall be configured as follows:

i. Memory – 16 GB (8 GB Minimum.)

ii. CPU– Intel Quad Core processor. 3.2 GHz Clock Speed (minimum.)

iii. Hard Drive – 500 GB hard drive capacity.

iv. Hard drive backup system – CD/RW, DVD/RW or network backup software provided by owners IT department.

v. Ports – (2) USB 3.0, Ethernet, VGA, microphone/headset.

vi. Keyboard – 101 Keyboard and 2 Button Mouse.

vii. Display configuration – 1-2 displays as follows:

- Each Display – 24” LED Flat Panel Monitor 1920 x 1080 resolution minimum.
- 16 bit or higher color resolution.
- Display card with multiple monitor support.

b. Operating System Software

i. Windows 10 Professional or Enterprise Edition with Ann. Update (64 bit.)

ii. Provide complete operator workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.

iii. Provide software registration cards to the Owner for all included software.

c. Peripheral Hardware

i. Reports printer (Dedicated):

- Printer Make – Hewlett Packard DeskJet.
- Print Speed – 600 DPI Black, 300 DPI Color.
- Buffer – 64 K Input Print Buffer (minimum.)

3. Application and Data Server

a. PC Hardware – The personal computer shall be configured as follows:

i. Memory – 8 GB.

ii. CPU – Intel Dual Core processor. 2.8 GHz Clock Speed (minimum.)

iii. Hard Drive – 240 GB free hard drive space after program installation.

iv. Hard Drive Backup – DVD/RW or 500 GB portable back-up drive.

v. Ports: (2) USB 3.0, VGA, HDMI 1920x1080 resolution, Ethernet – 10/100/1000.

vi. User Interface:

- 101 key full size QWERTY Keyboard with number pad.
- Two (2) Button LED mouse.
- LED flat panel 24 in. monitor with wide screen full HD resolution.

b. Software/Operating System Requirements

i. Windows 10 Pro or Windows 10 Enterprise Editions with Anniversary Update (version 1607) (64-bit.)

ii. SQL 2014 Express SP3 (64-bit.)

iii. Microsoft Office Professional.

iv. BMS supplier-specific programs and files required for described functionality.

4. Extended Application and Data Server

a. PC Hardware – The personal computer(s) shall be configured as follows:

i. Memory – 16 GB (8 GB Minimum.)

ii. CPU – Intel Quad Core processor. 3.2 GHz Clock Speed (minimum.)

iii. Optical Media Drive – DVD-RW 16x.

iv. Hard Drives – 2x 500GB configured as Raid 1 (mirroring) with write caching turned on.

v. Hard Drive Backup – 1TB portable back-up drive or secure network backup provided by owner's IT department.

vi. Ports: (2) USB 3.0, HDMI capable of Wide screen 1920x1080 resolution, Ethernet 10/100/1000.

vii. User Interface:

- 101 key full size QWERTY Keyboard with number pad.
- Two (2) Button LED mouse.
- LED flat panel 24 in. monitor with wide screen full HD resolution.

b. Software/Operating System Requirements

i. Windows Server 2012 (64-bit.)

ii. SQL 2014 SP2 (64-bit.)

iii. Microsoft Office Professional.

iv. BMS supplier-specific programs and files required for described functionality.

5. Local Control Panels

a. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508A label listing compliance. Control panels shall be fully enclosed, with sub-panel, hinged door, and flush latch.

b. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.

c. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.

d. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

e. All wiring shall be neatly installed in plastic trays or tie-wrapped.

f. Control panels for use in seismic areas shall be built in an approved facility and carry the appropriate label.

g. Except where otherwise noted, all standard and custom control panels shall be built in an ISO9002 certified facility.

6. Power Supplies

a. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.

b. Input: 120 VAC +10%, 60Hz.

c. Output: 24 VDC.

d. Line Regulation: +0.05% for 10% line change.

e. Load Regulation: +0.05% for 50% load change.

f. Ripple and Noise: 1 mV rms, 5 mV peak to peak.

g. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.

h. A power disconnect switch shall be provided next to the power supply.

Part 3 – Performance/Execution

3.A BMS Specific Requirements

1. Graphic Displays
   a. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
   b. User shall access the various system schematics via a graphical penetration scheme and/or menu selection.
2. Custom Reports:
   a. Provide custom reports as required for this project.
3. Actuation / Control Type
   a. Primary Equipment
      i. Controls shall be provided by equipment manufacturer as specified herein.
      ii. All damper and valve actuation shall be electric.
   b. Air Handling Equipment
      i. All air handlers shall be controlled with a HVAC-DDC Controller.
      ii. All damper and valve actuation shall be electric.
   c. Terminal Equipment:
      iii. Terminal Units (VAV, UV, etc.) shall have electric damper and valve actuation.
      iv. All Terminal Units shall be controlled with HVAC-DDC Controller.

3.B Installation Practices

1. BMS Wiring
   a. All conduit, wiring, accessories and wiring connections required for the installation of the BMS, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 24 Electrical. All wiring shall comply with the requirements of applicable portions of Division 24 and all local and national electric codes, unless specified otherwise in this section.
   b. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
   c. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
   d. Class 2 Wiring
      i. All Class 2 (24 VAC or less) wiring shall be installed in conduit unless otherwise specified.

ii. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.

e. Class 2 signal wiring and 24 VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

f. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

2. BMS Line Voltage Power Source

a. 120-volt AC circuits used for the BMS shall be taken from panel boards and circuit breakers provided by Division 24.

b. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.

c. DDC terminal unit controllers may use AC power from motor power circuits.

3. BMS Raceway

a. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".

b. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.

c. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.

d. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

4. Penetrations

a. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.

b. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.

c. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.

d. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

5. BMS Identification Standards

a. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.

b. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

6. BMS Panel Installation

a. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.

b. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.

7. Input Devices

   a. All Input devices shall be installed per the manufacturer recommendation.

   b. Locate components of the BMS in accessible local control panels wherever possible.

8. HVAC Input Devices – General

   a. All Input devices shall be installed per the manufacturer recommendation.

   b. Locate components of the BMS in accessible local control panels wherever possible.

   c. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.

   d. Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.

   e. Outside Air Sensors

      i. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outdoor air conditions accurately.

      ii. Sensors shall be installed with a rain proof, perforated cover.

   f. Water Differential Pressure Sensors

      i. Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device.

      ii. Differential pressure transmitters shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines.

      iii. The transmitters shall be installed in an accessible location wherever possible.

   g. Medium to High Differential Water Pressure Applications (Over 21" WC)

      i. Air bleed units, bypass valves and compression fittings shall be provided.

   h. Building Differential Air Pressure Applications (-1" to +1" WC)

      i. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.

      ii. The interior tip shall be inconspicuous and located as shown on the drawings.

   i. Air Flow Measuring Stations

      i. Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct.

      ii. Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.

   j. Duct Temperature Sensors

i. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.

ii. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.

iii. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.

iv. The sensor shall be mounted to suitable supports using factory approved element holders.

k. Space Sensors

i. Shall be mounted per ADA requirements.

ii. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.

l. Low Temperature Limit Switches

i. Install on the discharge side of the first water or steam coil in the air stream.

ii. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.

iii. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

m. Air Differential Pressure Status Switches

i. Install with static pressure tips, tubing, fittings, and air filter.

n. Water Differential Pressure Status Switches

i. Install with shut off valves for isolation.

o. HVAC Output Devices

i. All output devices shall be installed per the manufacturers' recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.

ii. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.

iii. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.

iv. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

v. Electronic Signal Isolation Transducers: Whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide

ground plane isolation between systems. Signals shall provide optical isolation between systems.

3.C Training

3.D The BMS contractor shall provide the following training services:

a. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.E Commissioning Requirements

1. Fully commission all aspects of the BMS work.

b. The BMS Contractor shall issue a report based on a sampling of the VAV calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.

c. Promptly rectify all listed deficiencies and submit a document summarizing completion to the Engineer.

3.F Performance Verification

1. The installing contractor shall perform a complete Performance Validation (PV) of the Building management system three times throughout the project:

a. At project turnover to customer.

b. At six (6) months of project operation.

c. At twelve (12) months of project operation or end of warranty.

2. Performance Verification shall include a complete and current Building Automation System site inventory including the following information at a minimum: a listing of all field and supervisory controllers with the following key attribute data; corresponding model numbers, firmware versions, available security updates, CPU and memory performance data, battery conditions, integrations, controlled equipment, and device and point counts.

3. Performance Verification shall include a complete written evaluation of system configuration and performance in the following categories:

a. Security – The Security evaluation shall include information about controllers that require security updates and conformance of user accounts to latest security rules and best practices.

b. Energy Performance – The Energy Performance and Savings evaluation shall identify opportunities through schedule and nightly setbacks, economizers, eliminating simultaneous heating and cooling and adding VSD to equipment.

c. Comfort and Health – The Comfort and Health evaluation shall identify temperature, pressure, and carbon dioxide values that deviate from desired set points that could lead to occupant discomfort.

d. Reliability – The Reliability evaluation shall identify overridden control points, control points creating excessive alarms, and opportunities to adding control points and trends to further enable system functionality.

e. Standards – The Standards evaluation shall identify conformance to published standards for point count, network performance and protocol standards.

4. Provide all reports as specified on a new, USB compatible flash drive.

23 09 93 Sequence of Operation for HVAC Controls

Part 1 – Sequence of Operation

1.A Sequence of Operation

Refer to equipment specifications and drawings for sequence of operations.

Part 2 – Points list

2.A Point Lists

Refer to equipment specifications and drawings for additional points.

Systems	**AHU 1,2,3,4**					
Point	**Description**	**Type**	**Units**	**Trend**	**Alarm**	**Totalize**
DA-P	Discharge Static Pressure	AI	in WC	X		
DA-T	Discharge Air Temperature	AI	Deg F	X		
PH-T	Preheat Temperature	AI	Deg F	X		
SF-S	Supply Fan Status	BI	Off On	X	X	X
PH-O	Preheat Output	AO	%	X		
RH-O	Reheat Output	AO	%	X		
CLG-O	Cooling Output	AO	%	X		
SF-O	Supply Fan Output	AO	%	X		
SF-C	Supply Fan Command	BO	Off On	X		
PH-LCKO	Preheat Lockout Command	BO	Off On	X		
CLG-LCKO	Cooling Lockout Command	BO	Off On	X		
RH-LCKO	Reheat Lockout Command	BO	Off On	X		
DAT-SP	Discharge Temperature Setpoint	AO	Deg F	X		
PHT-SP	Preheat Temperature Setpoint	AO	Deg F	X		
DAP-SP	Discharge Static Pressure Setpoint	AO	in WC	X		

SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Contractual Relationship
1. The scope of the TAB work as defined in this Section is indicated in order that the Contractor will be advised of the coordination, adjustment, and system modification which will be required under the project work in order to complete the requirements for final TAB. The TAB firm will not have a contractual relationship with the Mechanical Contractor, but will be responsible to the General Contractor for the satisfactory execution of the TAB work. **The General Contractor in his original bid shall include the costs required to cover all work which may be required in the TAB phases as defined herein and as may be necessary for the completion of the TAB work as defined by the TAB firm**.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:
a. Primary-secondary hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

B. TAB Conference: Meet with Architect & Owner’s representative on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 15 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in

AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 15 Section "Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 15 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 15 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 15 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.9 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches (mm), and bore.
   i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
   j. Number, make, and size of belts.
   k. Number, type, and size of filters.

2. Motor Data:

   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches (mm), and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

   a. Total air flow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Filter static-pressure differential in inches wg (Pa).
   f. Preheat-coil static-pressure differential in inches wg (Pa).
   g. Cooling-coil static-pressure differential in inches wg (Pa).
   h. Heating-coil static-pressure differential in inches wg (Pa).
   i. Outdoor airflow in cfm (L/s).
   j. Return airflow in cfm (L/s).
   k. Outdoor-air damper position.
   l. Return-air damper position.
   m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch (mm) o.c.

f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig (kPa).

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated air flow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual air flow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary air flow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final air flow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.

b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm (L/s).
g. Water pressure differential in feet of head or psig (kPa).
h. Required net positive suction head in feet of head or psig (kPa).
i. Pump rpm.
j. Impeller diameter in inches (mm).
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig (kPa).
b. Pump shutoff pressure in feet of head or psig (kPa).
c. Actual impeller size in inches (mm).
d. Full-open flow rate in gpm (L/s).
e. Full-open pressure in feet of head or psig (kPa).
f. Final discharge pressure in feet of head or psig (kPa).
g. Final suction pressure in feet of head or psig (kPa).
h. Final total pressure in feet of head or psig (kPa).
i. Final water flow rate in gpm (L/s).
j. Voltage at each connection.
k. Amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.

b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
c. Verify that balancing devices are marked with final balance position.
d. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
3. Construction Manager shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

3.20 DUCT LEAKAGE TESTING

A. Contractor shall prepare ductwork for leakage testing by test and balance firm. Contractor shall remake any joints and/or duct runs which do not comply with maximum allowable leakage rates for retest by test and balance firm. Mechanical Contractor shall be responsible for any compensation due to the test and balance firm for additional testing required as a result of initial system failure.

B. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
   1. Test ductwork assemblies in excess of 1-1/2 inch static pressure class installed by Mechanical Contractor.
   2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
   3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).

END OF SECTION 15950

SECTION 15955 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 ALLOWANCES

A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Division 01 Section "Allowances."

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.6 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.7 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

1.8 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 Testing AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least **10** days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing **Contractor 10** days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing **Contractor** shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R **Contractor**, testing and balancing **Contractor**, and HVAC&R Instrumentation and Control **Contractor** shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 23 boiler Sections. Provide submittals, test data, inspector record, and boiler certification to the CxA.

B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 23 piping Sections. HVAC&R **Contractor** shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

END OF SECTION 15955

SECTION 16051 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16051

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1. Overhead-lines grounding.
2. Underground distribution grounding.
3. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm) in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING OVERHEAD LINES

A. Comply with IEEE C2 grounding requirements.

B. Install 2 parallel ground rods if resistance to ground by a single, ground-rod electrode exceeds 25 ohms.

C. Drive ground rods until tops are 12 inches (300 mm) below finished grade in undisturbed earth.

D. Ground-Rod Connections: Install bolted connectors for underground connections and connections to rods.

E. Lightning Arrester Grounding Conductors: Separate from other grounding conductors.

F. Secondary Neutral and Transformer Enclosure: Interconnect and connect to grounding conductor.

G. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 2 Section "Underground Ducts and Utility Structures," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.

2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.
7. ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.

H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

I. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.9 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 9 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trenchexceeds 16 inches (400 mm) overall.

J. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Power.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

F. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless

otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    g. Enclosed switches.
    h. Enclosed circuit breakers.
    i. Enclosed controllers.

j. Push-button stations.
k. Contactors.

END OF SECTION 16075

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. Division 16 Section "Voice and Data Communication Cabling" for cabling used for voice and data circuits.
2. Division 16 Section "Undercarpet Cables" for flat cables for undercarpet installations.
3. Division 16 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing

Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. Encore Wire
4. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN SO.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.

J. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.

K. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

L. Class 1 Control Circuits: Type THHN-THWN, in raceway.

M. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Electrical Supports and Seismic Restraints."

F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
1. For handholes and boxes for underground wiring, including the following:

a. Duct entry provisions, including locations and duct sizes.
b. Frame and cover design.
c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: , set-screw type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum installation.

2.4 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast or sheet metal, semi-adjustable, rectangular.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

J. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Green.
2. Configuration: Units shall be designed for flush burial and have integral closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

8. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.
d. NewBasis.

B. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. Christy Concrete Products.
d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carson Industries LLC.
b. Christy Concrete Products.
c. Nordic Fiberglass, Inc.

2.9 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.10 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

4. Use insulating bushings to protect wiring.

M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
   d. Attics: 135 deg F (75 deg C) temperature change.
   e. Insert location and corresponding temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 2 Section "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches

(300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Snap switches and wall-box dimmers.
5. Hospital-grade receptacles.
6. Wall-switch and exterior occupancy sensors.
7. Communications outlets.
8. Pendant cord-connector devices.
9. Cord and plug sets.
10. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

B. Related Sections include the following:

1. Division 16 Section "Voice and Data Communication Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).

d. Pass & Seymour; 5381 (single), 5352 (duplex).

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; CR 5253IG.
b. Leviton; 5362-IG.
c. Pass & Seymour; IG6300.

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GF20.
b. Pass & Seymour; 2084.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; L520R.
b. Hubbell; HBL2310.
c. Leviton; 2310.
d. Pass & Seymour; L520-R.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; IG2310.
b. Leviton; 2310-IG.

2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw

terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

3. Description: Single pole, with factory-supplied key in lieu of switch handle.

D. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

E. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.6 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 COMMUNICATIONS OUTLETS

A. Telephone Outlet:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 3560-6.
b. Leviton; 40649.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 3562.
b. Leviton; 40595.

3. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.8 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant thermoplastic with lockable cover.

2.9 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.

3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 16140

SECTION 16145 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single space wireless lighting control systems and associated components:
   1. Wireless occupancy/vacancy sensors.
   2. Wireless daylight sensors.
   3. Wired load control modules with wireless communication inputs.
      a. Includes fixture control modules with wired occupancy/vacancy/daylight sensors.
   4. Wired receptacles with wireless communication inputs.
   5. Wireless fixture control components factory-installed in luminaires not specified in this section.
   6. Wired wall dimmers and switches with wireless communication inputs.
   7. Wireless control stations.
   8. Fluorescent electronic dimming ballasts.
   9. LED Drivers.
   10. Power interfaces.
   11. Digital dimming ballast modules.

B. Wireless hub(s) for centralized control, monitoring, and system integration.

1.02 RELATED REQUIREMENTS

A. Section 15900: Facility Management System, for interface with lighting control system.
B. Section 16075 - Electrical Identification: Identification products and requirements.
C. Section 16140 - Wiring Devices:
   1. Finish requirements for wall controls specified in this section.
   2. Accessory receptacles and wallplates, to match lighting controls specified in this section.
D. Section 16511 - Interior Lighting

1.03 REFERENCE STANDARDS

A. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.
B. ANSI/ESD S20.20 - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2014.
C. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).
D. CAL TITLE 24 P6 – California Code of Regulations, Title 24, Part 6 (California Energy Code); 2013.
E. CSA C22.2 No. 223 – Power Supplies with Extra-low-voltage Class 2 Outputs; 2015.
F. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.
G. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.
H. IEC 61347-2-3 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2011.
I. IEEE 1789 - Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers; 2015.
J. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
K. ISO 9001 - Quality Management Systems-Requirements; 2008.
L. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
M. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

N. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011.
O. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
P. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
R. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
S. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
T. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
U. UL 1310 – Class 2 Power Units; Current Edition, Including All Revisions.
V. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
W. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.
X. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.
Y. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall controls with actual installed door swings.
3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-Wire Meeting; Lutron LSC-PREWIRE: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
1. Low voltage wiring requirements.
2. Separation of power and low voltage/data wiring.
3. Wire labeling.
4. Wireless hub locations and installation.
5. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
6. Control locations.
7. Computer jack locations.
8. Load circuit wiring.
9. Network wiring requirements.
10. Connections to other equipment.
11. Installer responsibilities.

C. Sequencing:

1. Do not install sensors and wall controls until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.

C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.
   2. Wall Dimmers: Include derating information for ganged multiple devices.

D. Samples:
   1. Wall Controls:
      a. Show available color and finish selections.
   2. Provide one sample for each product proposed for substitution;

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed locations and settings for lighting control system components.

G. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under “WARRANTY”. Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:
   1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
   2. Registered to ISO 9001, including in-house engineering for product design activities.
   3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
   4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.
   1. Basis of Design System Requirements - Lutron, Unless Otherwise Indicated:
      a. Ambient Temperature:
         1) Lighting Control System Components, Except Fluorescent Electronic Dimming Ballasts: Between 32 and 104 degrees F (0 and 40 degrees C).
         2) Fluorescent Electronic Dimming Ballasts: Between 50 and 140 degrees F (10 and 60 degrees C).
      b. Relative Humidity: Less than 90 percent, non-condensing.

c. Protect lighting controls from dust.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Standard Warranty, With Manufacturer Full-Scope Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:

1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
   a. First Two Years:
      1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
      2) First-available on-site or remote response time.
      3) Remote diagnostics for applicable systems.
   b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
2. Lighting Management System Computer: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.
3. Ballasts/Drivers and Ballast Modules:
   a. With Remote Full-Scope Start-Up: Three years 100 percent parts coverage, no manufacturer labor coverage.
   b. With On-Site Full-Scope Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.
   c. With On-Site Full-Scope Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com.

B. Other Acceptable Manufacturers:

1. N Light by Spectrum Lighting.
2. Greengate by 2M Lighting.
3. Products by listed manufacturers are subject to compliance with specified requirements and prior approval of Architect or Engineer.

C. Substitutions:

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by Architect a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
2. Any proposed substitutions to be reviewed by Architect at Contractor's expense;
3. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for all required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from the original design highlighted in an alternate color for review and approval by Architect prior to rough-in.

D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

C. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
E. Power Failure Recovery: When power is interrupted for periods up to 10 years, and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
F. Wireless Devices:
   1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
   2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
   3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
   4. System does not require a factory technician to set up or program the system.
   5. Capable of diagnosing system communications.
   6. Capable of having addresses automatically assigned to them.
   7. Receives signals from other wireless devices and provides feedback to user.
   8. Capable of determining which devices have been addressed.
   9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.
   10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.
G. Wireless Network:
   1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
      a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
      b. Wireless devices operate in an uncongested frequency band providing reliable operation.
      c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).
   2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
   3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
      a. Reliability of system performance.
      b. Fast response time to events in the space (e.g. button presses or sensor signals).
      c. Independent operation in the event of the wireless hub being removed or damaged.
H. Device Finishes:
   1. Standard Colors: Comply with NEMA WD1 where applicable.
   2. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
   3. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.
I. Interface with building automation system as specified in Section 15900; Lutron System and Network Integration Consultation; LSC-INT-VISIT.

2.03 WIRELESS SENSORS

A. General Requirements:

1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Wireless Occupancy/Vacancy Sensors:
1. General Requirements:
   a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
   b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
   d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
   e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
   f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
   g. Color: White.
   h. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
   i. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
   j. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.
   k. Ceiling-Mounted Sensors:
      1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
      2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
   l. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.
2. Wireless Combination Occupancy/Vacancy Sensors:
   a. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).
   b. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
   c. Product(s):
      1) Ceiling-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH; Coverage from 324 square feet

(30.2 sq m) to 676 square feet (62.4 sq m) depending on ceiling height from 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.

2) Wall-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH; Minor motion coverage of 1500 square feet (139.4 sq m) and major motion coverage of 3000 square feet (278.7 sq m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); 180 degree field of view.

3) Corner-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OKLB-P-WHMinor motion coverage of 1225 square feet (113.8 sq m) and major motion coverage of 2500 square feet (232.3 sq m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); 90 degree field of view.

4) Hallway Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OHLB-P-WHMajor motion coverage of up to 150 feet (45.7 m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); narrow field of view.

3. Wireless Vacancy-Only Sensors:
   a. Operates only as a vacancy sensor (manual-on and automatic-offIf more than one model is required, the optional choice can be used to assign type designations. Make sure that designations indicated on the drawings are consistent with those specified here.

C. Hallway Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VHLB-P-WH; Major motion coverage of up to 150 feet (45.7 m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); narrow field of view. Wireless Daylight Sensors:
   1. Product: Lutron Radio Powr Savr Series, Model LFR2-DCRB-WH.
   2. Open-loop basis for daylight sensor control scheme.
   3. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
   4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
   5. Provide linear response from 2 to 150 footcandles.
   6. Color: White.
   7. Mounting:
      a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
      b. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
      c. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
   8. Meets CAL TITLE 24 P6 requirements.

2.04 LOAD CONTROL MODULES

A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

B. Junction Box-Mounted Modules:
   1. Plenum rated.
   2. Dimming Modules:
      a. Product(s):
         1) 8 A dimming module with 0-10V control; Lutron PowPak Dimming Module Model RMJS-8T-DV-B
      b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.

c. Single low voltage dimming module with Class 1 or Class 2 isolated 0-10V output signal conforming to IEC 60929 Annex E.2; source or sink automatically configures.
d. Selectable minimum light level.
e. Configurable high- and low-end trim.
f. Relay: Rated for 0-10 V ballasts, LED drivers, or fixtures that conform with NEMA 410.

3. Relay Modules:
   a. Product(s):
      1) 16 A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJS-16R-DV-B16 A relay module, with contact closure output; Lutron PowPak Relay Module Model RMJS-16RCCO1-DV-B5 A relay module, without contact closure output; Lutron PowPak Relay Module Model RMJS-5R-DV-B.
      2) 5 A relay module, with contact closure output; Lutron PowPak Relay Module Model RMJS-5RCCO1-DV-B.
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
   c. Relay:
      1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
      2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.
   d. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Controlled by associated occupancy/vacancy sensors and wall controls.
4. 20 A Receptacle Modules:
   a. Product(s):
      1) 20 A receptacle module, without contact closure output; Lutron PowPak 20 A Relay Module Model RMJS-20R-DV-B.
      2) 20 A receptacle module, with contact closure output; Lutron PowPak 20 A Relay Module Model RMJS-20RCCO1-DV-B.
   b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, and ten wireless control stations.
   c. Relay:
      1) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
      2) Motor rating of 1 HP at 120 V, 2 HP at 277 V.
   d. Contact Closure Output:
      1) Single contact closure output with normally open and normally closed dry maintained contacts suitable for connection to third party equipment (e.g. building management system, HVAC system, etc.).
      2) Contact Ratings: Resistive load; 1 A at 0-24 VDC, 0.5 A at 0-24 VAC.
      3) Controlled by associated occupancy/vacancy sensors and wall controls.
5. Wired Fixture Sensors:
   a. Product(s):
      1) Wired occupancy/daylight fixture sensor; Lutron PowPak Fixture Sensor; Model FC-SENSOR.

2) Wired vacancy/daylight fixture sensor; Lutron PowPak Fixture Sensor; Model FC-VSENSOR.

b. Occupancy/Vacancy Sensing:
1) Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
2) Coverage: 300 square feet (28 sq m) with mounting height of 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.
3) Sensor Timeout: 15 minutes.
(a) Sensor timeout adjustable via Lutron Vive wireless hub when connected to compatible fixture control module.

c. Daylight Sensing:
1) Automatic calibration.
2) Provide linear response to changes in perceived light level.
(a) Response adjustable via Lutron Vive wireless hub when connected to compatible fixture control module.
3) Closed loop proportional control scheme.
4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).

d. Daylight Sensing:
1) Automatic calibration.
2) Provide linear response to changes in perceived light level.
(a) Response adjustable via Lutron Vive wireless hub.
3) Closed loop proportional control scheme.
4) Sensor Range: 0 to 150 footcandles (0 to 1600 lux).

e. Coordination between Integral and Wireless Sensors:
1) Occupancy/Vacancy Sensing: Integral and wireless sensors work in conjunction (occupancy detected by either sensor turns lights on and vacancy detected by both sensors turns lights off).
2) Daylight Sensing: Wireless sensor takes precedence over integral sensor.

C. Digital Bus Interface:
1. Product: Lutron OEM Digital Bus Interface; Model DFC-OEM-DBI.
2. Provides power for wireless fixture control dongle and up to four LED drivers (60mA at 17-19 VDC).
3. DALI compliant.
4. UL listed.

2.05 WIRED WALL DIMMERS AND SWITCHES WITH WIRELESS COMMUNICATION INPUTS

A. General Requirements:
1. Provide air gap service switch to disconnect power to load for safe lamp replacement, accessible without removing faceplate.
2. Operates at the rated capacity across the full ambient temperature range including modified capacities for ganged configurations which require removal of fins.
3. Provide radio frequency interference suppression.
4. Surge Tolerance: Designed and tested to withstand surges of 6,000 V, 200 amps according to IEEE C62.41.2 without impairment to performance.
5. Dimmers: Provide full range, continuously variable control of light intensity.
6. Dimmers for Electronic Low Voltage (ELV) Transformers:
a. Provide circuitry designed to control the input of electronic (solid-state) low voltage (ELV) transformers. Do not use dimmers that utilize standard phase control.

b. Provide resettable overload protection that provides automatic shut-off when dimmer capacity is exceeded. Do not use protection methods that are non-resettable or require device to be removed from outlet box.
c. Designed to withstand a short, per UL 1472, between load hot and either neutral or ground without damage to dimmer.

7. Dimmers for Magnetic Low Voltage (MLV) Transformers:
   a. Provide circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
   b. Magnetic low voltage transformers to operate below rated current or temperature.
8. Electronic Switches:
   a. Listed as complying with UL 20, UL 508, and UL 1472.

B. Preset Smart Wall Dimmers and Switches with Wireless Communication Inputs; Lutron Maestro Wireless Series:
1. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
2. Dimmer Control: Multi-function tap switch with small, raised rocker for dimmer adjustment.
   a. Rocker raises/lowers light level, with new level becoming the current preset level.
   b. Switch single tap raises lights to preset level or fades lights to off.
   c. Switch double tap raises light to full on level.
   d. Switch tap and hold slowly fades lights to off over period of 10 seconds.
   e. LEDs adjacent to tap switch indicate light level when dimmer is on, and function as locator light when dimmer is off.
3. Switch Control: Switch single tap turns lights on/off.
4. Dimmer High End Trim:
   a. Incandescent Dimmers: Minimum of 92 percent of line voltage.
   b. Dimmers for Electronic Low Voltage (ELV) Transformers: Minimum of 95 percent of line voltage.
   c. Dimmers for Magnetic Low Voltage Transformers: Minimum of 92 percent of line voltage.
5. Product(s) - Preset Smart Dimmers with Wireless Communication Inputs:
   a. Preset Smart Dimmer; Lutron Maestro Wireless Series: Incandescent/halogen (600 W, 120 V), magnetic low voltage (600 VA/450 W, 120 V), dimmable CFL/LED (150 W, 120 V); multi-location capability using companion dimmers (up to nine companion dimmers may be connected); minimum load requirement.
      1) Lutron Model MRF2S-6CL; single pole/multi-location; 120 V.
   b. Preset Smart Dimmer; Lutron Maestro Wireless Series: Electronic low voltage (600 W, 120 V); neutral required; multi-location capability using companion dimmers (up to nine companion dimmers may be connected); minimum load requirement.
      1) Lutron Model MRF2S-6ELV-120; single-pole/multi-location; 120 V.
   c. Preset Smart Dimmer; Lutron Maestro Wireless Series: Incandescent (600 W, 120 V), magnetic low voltage (600 VA/450 W, 120 V); neutral required; multi-location capability using companion dimmers (up to nine companion dimmers may be connected); minimum load requirement.
      1) Lutron Model MRF2S-6ND-120;; single-pole/multi-location; 120 V.
   d. Companion Dimmer: Provides multi-location capability for compatible Lutron Maestro Wireless Series dimmers.
      1) Lutron Model MA-R;; gloss finish; 120 V.
      2) Lutron Model MSC-AD; satin finish; 120 V.

e. Companion Switch: Provides multi-location capability for compatible Lutron Maestro Wireless Series electronic switches.
   1) Lutron Model MA-AS; gloss finish; 120 V.
   2) Lutron Model MSC-AS; satin finish; 120 V.

2.06 WIRELESS CONTROL STATIONS

A. Product(s):
   1. Wallbox Adapter; Lutron Model PICO-WBX-ADAPT.
B. Quantity: As indicated on the drawings Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
C. Does not require external power packs, power or communication wiring.
D. Allows for easy reprogramming without replacing unit.
E. Button Programming:
   1. Single action.
   2. Toggle action.
F. Includes LED to indicate button press or programming mode status.
G. Mounting:
   1. Capable of being mounted with a table stand or directly to a wall under a faceplate.
   2. Faceplates: Provide concealed mounting hardware.
H. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).

2.07 WIRELESS HUBS

A. Product(s):
   1. Wireless hub with BACnet; Lutron Vive Premium Hub.
      a. Flush-mount wireless hub; Model HJS-2-FM.
      b. Surface-mount wireless hub; Model HJS-2-SM.
B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.
C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.
D. Utilizes Ethernet connection for:
   1. Networking up to 64 hubs together to create a larger system.
   2. Integration with Building Management System (BMS) via native BACnet; does not require interface (Lutron Vive Premium wireless hub with BACnet only).
   3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).
E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.
F. Communicates directly to compatible Lutron Vive RF devices through use Lutron Clear Connect radio frequency communications link; does not require communication wiring; RF range of 71 feet (23 m) through walls to cover an area of 15836 square feet (1471 sq m) (device and hub must be on the same floor).
G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi, 2.4 GHz 802.11b/g; wireless range of 71 feet (23 m) through walls (device and hub must be on the same floor).
   1. Does not require external Wi-Fi router for connecting to the hub.
H. Allows for system setup, control, and monitoring from mobile device or computer using Vive web-based software:
   1. Supports up to 700 total paired devices including compatible wireless sensors, wireless control stations, and wireless load devices.
   2. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).
      a. Timeclock is integrated into the unit and does not require a constant internet connection.

b. Retains time and programming information after a power loss.
c. Utilizes weekly calendar view for monitoring and adjustment of scheduled events.
d. Time clock events can be scheduled to:
1) Send lights to a desired level.
2) Adjust level lights go to when occupied.
3) Adjust level lights go to when unoccupied.
4) Enable/disable occupancy.
5) Adjust timeout of sensors (requires Model FC-SENSOR wired fixture sensor or Model DFCSJ-OEM-OCC wireless fixture control dongle with integral sensing capabilities).

3. Daylighting:
a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.
b. Daylight set point can be adjusted with the software to increase or decrease the electric light level in the room based on the same amount of natural light.
4. Allows for control, monitoring, and adjustment from anywhere in the world (Lutron Vive wireless hub internet connection required).
5. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
a. Association and setup does not require a factory technician to perform.
6. System using Lutron Vive wireless hub(s) can operate with or without connection to the internet.
7. Supports energy reporting.
a. Reports measured energy data for PowPak fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
b. Reports calculated energy data for PowPak junction box mounted modules at accuracy of 10 percent.
8. Supports automatic demand response for load shedding via:
a. Local contact closure without need for separate interface.
b. BACnet (Lutron Vive Premium wireless hub with BACnet only).
9. Wireless hub can be firmware upgraded to provide new software features and system updates.
a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.

I. Lutron Vive Web-Based Application:
1. Accessibility and Platform Support:
a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
f. WPA2 security for Wi-Fi communication with wireless hub.
2. System Navigation and Status Reporting:
a. Area Tree View: Easy navigation by area name to view status and make programing adjustments through the software.
b. Area and device names can be changed in real time.
3. Setup app available for iOS and Android that allows for:

a. Job registration to extend product warranty.
b. Management of setup for multiple projects in different locations.
c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
d. Access to native help and instructions to assist user with Vive system setup.

J. BACnet Integration (Lutron Vive Premium wireless hub with BACnet only):
1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
2. Requires only one network connection per hub.
3. BACnet Integrator Capabilities:
a. The BACnet integrator can command:
1) Area light output.
2) Area load shed level.
3) Area load shed enable/disable.
4) Enable/Disable:
(a) Area occupancy sensors.
(b) Area daylighting.
5) Daylighting level.
6) Area occupied and unoccupied level
7) Occupancy sensor timeouts (for fixture sensors).
b. The BACnet integrator can monitor:
1) Area on/off status.
2) Area occupancy status.
3) Area load shed status.
4) Area instantaneous energy usage and maximum potential power usage.
5) Enable/Disable:
(a) Area occupancy sensors.
(b) Daylighting.
(c) Timeclocks.
6) Daylighting level.
7) Light levels from photo sensors.
8) Area occupied and unoccupied level.
9) Occupancy sensor timeouts.

K. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.
L. Rated for use in air-handling spaces as defined in UL 2043.
M. Meets CAL TITLE 24 P6 requirements.
N. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer's instructions; do not exceed manufacturer's required maximum wiring segment lengths.
1. Product(s):
a. Lutron Model ETH-SWITCH-16; 16 port.
b. Lutron Model ETH-SWITCH-24; 24 port.
c. Lutron Model ETH-SWITCH-24-1M; 24 port, 1 multi-mode fiber.
d. Lutron Model ETH-SWITCH-24-2M; 24 port, 2 multi-mode fiber.
e. Lutron Model ETH-SWITCH-24-1S; 24 port, 1 single-mode fiber.
f. Lutron Model ETH-SWITCH-24-2S; 24 port, 2 single-mode fiber.

2.08 SOURCE QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Factory Testing; Lutron Standard Factory Testing:
1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.
2. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.

3. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive system components.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. System and Network Integration Consultation; Lutron LSC-INT-VISIT: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
   1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards;, including mounting heights specified in those standards unless otherwise indicated.
B. Install products in accordance with manufacturer's instructions.
C. Sensor Locations:
   1. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.
   2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.
D. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.
E. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
F. Lamp Lead Lengths: Do not exceed 3 feet (0.9 m) for T4 4-pin compact and T5 BIAX lamps and 7 feet (2.1 m) for T5, T5-HO, T8 U-bend, and T8 linear fluorescent lamps.
G. LED Light Engine/Array Lead Length: Do not exceed 100 feet (31 m).
H. Identify system components in accordance with Section 26 0553.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Manufacturer's Full-Scope Start-Up Service is required.
C. Manufacturer’s Programming Service:
   1. Product(s):
      a. On-site programming, 8-hour block; Lutron LSC-OS-PROG8-SP.
   2. Include as part of the base bid additional costs for manufacturer to perform on-site.
   3. Furnish unit prices for each available programming time interval.
D. Manufacturer's Full-Scope Start-Up Service:

1. On-Site Full-Scope Start-Up Service; Lutron LSC-OS-SU-VIVE: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system startup and verify proper operation:
   a. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
   b. Verify connection of power wiring and load circuits.
   c. Verify connection and location of controls.
   d. Energize wireless hubs.
   e. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.
   f. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".
   g. Program timeclock schedules per approved sequence of operations.
   h. Configure load shed parameters per approved sequence of operations.
   i. Verify system operation control by control.
   j. Obtain sign-off on system functions.
   k. Train Owner's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".

E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 COMMISSIONING

A. See Section 01 9113 for commissioning requirements.

B. Title 24 Acceptance Testing Service; Lutron LSC-SPV-DOC-T24: Include as part of the base bid additional costs for Lighting Control Manufacturer to perform lighting control acceptance testing in accordance with CAL TITLE 24 P6. Submit required documentation.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.
   1. Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.
   2. Customer-Site Solution Training Visit; Lutron LSC-TRAINING-SP: Include as part of the base bid additional costs for Lighting Control Manufacturer to provide one day of additional on-site system training.

C. On-Site Warranty Audit Visit; Lutron LSC-WNTY-AUD: Where Manufacturer On-Site Full-Scope Start-Up Service is not provided, include services of manufacturer to perform on-site verification that system meets manufacturer’s requirements as necessary for validation of specified enhanced warranty.

3.08 MAINTENANCE

A. See Section 01 7000 – Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. .

3.09 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION 16145

SECTION 16289 - SURGE PROTECTIVE DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Sections:

1. Division 16 Section "Switchboards" for factory-installed SPD.
2. Division 16 Section "Panelboards" for factory-installed SPD.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. VPR: Voltage Protection Rating.

C. SPD: Surge Protective Device(s).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

B. Qualification Data: For qualified testing agency.

C. Product Certificates: For SPDs, from manufacturer.

D. Field quality-control reports.

E. Operation and Maintenance Data: For SPDs to include in emergency, operation, and maintenance manuals.

F. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: UL or an NRTL.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by UL, and marked for intended location and application.

C. Comply with ANSI/IEEE C62.41.1-2002 & ANSI/IEEE C62.41.2-2002 and test devices according to ANSI/IEEE C62.45-2002.

D. Shall be UL 1449 3rd Edition Listed and UL1283 complimentary listed.

E. Comply with NFPA 70.

F. Comply with NEC Article 285 – Correct Installation of Surge Protective Devices.

1.6 PROJECT CONDITIONS

A. Service Conditions: Rate SPDs for continuous operation under the following conditions unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage for 480Y/277 V and not less than 125 percent of nominal system voltage for 208Y/120 V.
2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet (6090 m) above sea level.

1.7 COORDINATION

A. Coordinate location of field-mounted SPDs to allow adequate clearances for maintenance.

B. Coordinate SPD with Division 26 Section "Electrical Power Monitoring and Control."

1.8 WARRANTY

A. Special Warranty: After SPD is installed per manufacturer's instructions, the manufacturer shall replace components of modular surge protection devices and replace complete non-modular suppressors that fail in materials or workmanship, or any other end-of life electrical event, including lightning within specified warranty period.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Special Warranty for Cord-Connected, Plug-in Surge Protective Devices: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge protective devices.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SURGE PROTECTIVE DEVICE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Current Technology Inc.
2. Thor Systems
3. Liebert
4. Advanced Protection Technologies (APT)

B. Surge Protection Devices:

1. Shall be UL 1449 3rd Edition Listed and UL1283 complimentary listed.
2. Modular design (with field-replaceable modules).
3. The SPD shall be UL labeled with a Short Circuit Current Rating (SCCR) of 200 kA. Fuse ratings shall not be considered in lieu of demonstrated withstand testing of the SPD, per NEC 285.6.
4. Fabrication using bolted compression lugs for internal wiring.
5. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. SPD shall include visual LED diagnostics including a minimum of one green LED indicator light per phase for protection status and one red service light.
8. SPD shall include a diagnostic test switch and an audible alarm, with an on/off silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
10. Six-digit transient-event counter with reset with EPROM memory, which retains the data while power is off to the SPD.
11. SPD shall be UL labeled as a Type 1 (verifiable at UL.com) intended for use without need for external or supplemental overcurrent control. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent to this specification.
12. SPD shall be UL labeled with 20 kA I nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
13. Suppression components shall be heavy duty, large block MOVs, each exceeding 30 mm in diameter.
14. SPD shall provide surge current paths for all modes of protection: L-N, L-G and N-G for wye systems; L-L and L-G in Delta and impedance grounded wye systems.
15. Integral disconnect switch if there is no breaker position is available.

C. Peak Single Impulse Surge Current Rating: 150 kA per mode/300 kA per phase.

D. Protection modes and UL 1449 Third Edition VPR for grounded wye circuits with 480Y/277 V, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 1200 V for 480Y/277 V
2. Line to Ground: 1200 V for 480Y/277 V
3. Neutral to Ground: 1200 V for 480Y/277 V

2.2 PANELBOARD SURGE PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Current Technology Inc.
2. Thomas & Betts
3. Thor Systems
4. Liebert
5. Advanced Protection Technologies (APT)

B. Surge Protection Devices:

1. Shall be UL 1449 3rd Edition Listed and UL1283 complimentary listed.
2. Non-Modular design.
3. The SPD shall be UL 1449 3rd Edition Listed and labeled with a Short Circuit Current Rating (SCCR) of 200 kA. Fuse ratings shall not be used in lieu of demonstrated withstand testing of the SPD per the NEC Article 285.6. The SPD shall match or exceed the panelboard short-circuit rating.
4. The SPD shall have redundant suppression circuits; with thermally protected individually fused metal-oxide varistors.
5. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
6. LED indicator lights for power and protection status.
7. Audible alarm, with silencing switch, to indicate when protection has failed.
8. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
9. Six-digit transient-event counter with reset.
10. SPD shall be UL labeled as a Type 1 (verifiable at UL.com) intended for use without need for external or supplemental overcurrent control. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over temperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent to this specification.
11. SPD shall be UL labeled with 20 kA I nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
12. Suppression components shall be heavy duty, large block MOVs, each exceeding 30 mm in diameter.
13. Integral disconnect switch if there is no breaker position is available.

C. Peak Single-Impulse Surge Current Rating: 150 kA per mode/ 300 kA per phase.

D. Protection modes and UL 1449 Third Edition VPR for grounded wye circuit with 480Y/277 V, 3-phase, 4-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V
2. Line to Ground: 700 V for 208Y/120 V
3. Neutral to Ground: 700 V for 208Y/120 V

2.3 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 1.

B. Outdoor Enclosures: NEMA 250 Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Per NEC2011 Article 285.23, install UL 1449 3rd Edition Listed and Labeled, Type 1 SPDs at the service entrance on the load side, with ground lead bonded to the service entrance ground.

B. Install SPD for panelboards and auxiliary panels with conductors or buses between the SPD and point of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
   1. Provide a 3-pole circuit breaker as a dedicated disconnecting means for SPD per SPD manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform inspections.

B. Manufacturer's Field Service: Verify that electrical wiring installation complies with manufacturer's written installation requirements.

C. Inspections:
   1. After installing SPDs but before electrical circuitry has been energized, test for compliance with requirements.
   2. Complete startup checks according to manufacturer's written instructions.

D. SPD will be considered defective if it does not pass inspections. Prepare test and inspection reports.

E. Prepare inspection reports.

F. Submit to engineer a schedule of installed SPDs listing the panel name, voltage configuration, and SPD part number and serial number. Also provide a digital image each SPD with panel cover removed to show SPD conductors and connections.

G. Do not energize the SPDs until the installer has verified service and separately derived system's neutral to ground bonding jumpers are installed and connected correctly per NEC.

END OF SECTION 16289

SECTION 16334 - HIGH VOLUME LOW SPEED (HVLS) FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes high-volume, low-speed fans.

1.3 DEFINITIONS

A. HVLS - High volume, low speed.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, furnished specialties, and accessories for each fan.
2. Certified fan performance curves with system operating conditions indicated.
3. Certified fan sound-power ratings.
4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
5. Material thickness and finishes, including color charts.
6. Fan speed controllers.
7. Product Data for EQ Credit "Thermal Comfort": Documentation indicating that systems, equipment, and controls comply.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Show dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For each HVLS fan.

1. Include design calculations and details for selecting product mounting components and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic forces required to select mounting components and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Qualification Data:

1. For Installer: Certificate from HVLS fan manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, controls, and accessories indicated and furnished for installation.

C. Seismic-Restraint Details:

1. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
2. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVLS fans to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by HVLS fan manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

    a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
    b. Demonstrated past experience on projects of similar complexity, scope, and value.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remove coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

E. Replace installed products damaged during construction.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of fans that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Motor, Including Controls: 15 year(s) from date of Substantial Completion.
b. For Parts, Including Blades and Hub: Lifetime.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Listed and labeled to UL 507.

C. CSA Compliance: Listed and labeled to CSA C22.2, No. 113.

D. ETL/Intertek certified to ANSI standards.

E. Comply with NFPA 13 requirements for HVLS fans.

F. AMCA Compliance:

1. Test HVLS fans in accordance with AMCA 230.

2. Certify HVLS fan performance in accordance with AMCA 211.

G. Performance Data: Comply with ANSI 230 test procedure standard, based on five rating points: 20-, 40-, 60-, 80-, and 100-percent of maximum speed. Comply with AMCA 211 for publication of performance data.

H. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design HVLS ceiling fans.

2.2 CAPACITIES AND CHARACTERISTICS

A. Fan:

1. Type: HVLS Selectable.
2. Number of Fan Blades: Five.
3. Fan Diameter: 14 feet (4.3 m)
4. Maximum Fan Speed: 105 rpm.
5. Fan Airflow at AMCA Rating Points cfm:

    a. Airflow at 20 Percent: 18834.52 cfm (665.13 L/s).
    b. Airflow at 40 Percent: 34290.65 cfm (1210.96 L/s).
    c. Airflow at 60 Percent: 50548.13 cfm (1785.09 L/s).
    d. Airflow at 80 Percent: 69013.99 cfm (2437.20 L/s).
    e. Airflow at 100 Percent: 86411.15 cfm (3051.97 L/s).

6. Fan Discharge Sound Power at Maximum Speed, dB: Less than 55 dBA.

B. Motor:

1. Size: 3/4 hp.
2. Speed: 105 rpm.
3. Volts: 480 V.
4. Phase: 3.
5. Hertz: 60 Hz.
6. Maximum Overcurrent Protection: In VFD, not motor.

2.3 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hunter Fan Company, Inc. Titan or comparable product by one of the following:

1. Big Ass Fans.
2. MacroAir.
3. Hunter

B. Source Limitations: Obtain HVLS fans from single source from single manufacturer.

2.4 HIGH-VOLUME, LOW-SPEED FANS

A. Description: Factory-assembled and -tested horizontal, non-ducted fan unit, consisting of large-diameter blade set, direct-drive electric motor, with variable-speed motor controller.

1. Provide fan designed to circulate large air volume, vertically, at low velocity.
2. Maximum Operating Temperature: 140 deg F.
3. Frame:

    a. Material: 6005A structural-grade aluminum blades. Structural steel blade holders.

        1) Finish: Anodized.

4. Diameter: 14 feet.
5. Blades: Airfoil type. Winglets and air fences not allowed.

    a. Quantity: 5.
    b. Material: 6005A structural-grade aluminum. Structural steel blade holders.
    c.

        1) Blade Finish: Anodized.

6. Blade Holders: Formed steel tube, pin retention system, saddle locking screws, extending into blade further for better support.

    a. Retention System: Held at lowest point of the fan with 1/4 size wire rope.
    b. Turnbuckles: Custom designed turnbuckles with brass-tipped set screws to hold their tension under vibration.

7. Motor: ODP. Direct drive. Gear driven systems not allowed.
8. Wiring and Controls Enclosure:

    a. NEMA 4X.
    b. Material: Aluminum.

        1) Enclosure Finish: Anodized.

    c. Grounded.

9. Controls: Provide wall-mounted keypad.

    a. Provide variable speed motor controller speed control.

    b. Motor controller shall be remote mounted. Motor controllers located on fan are not allowed.

10. Maximum Sound Power Level: Less than 55 dBA.
11. Standard Mounting Bracket: Steel beam/steel angle, I-beam.
12. Accessories:

    a. Mounting extension tube: 1 ft increments, 10 ft maximum.
    b. Temperature sensor-based fan operation controller..

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other conditions affecting HVLS fan performance, maintenance, and operations.

1. Fan locations indicated on Drawings are approximate. Determine exact locations before roughing-in for mounting, control, and electrical connections.

B. Examine roughing-in for mounting location, anchor-bolt sizes, and locations, to verify actual locations for mounting connections before installation of fan.

C. Examine areas for suitable conditions where fan will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HIGH-VOLUME LOW-SPEED FANS

A. Install fan in accordance with manufacturer's published instructions.

B. Comply with NECA 1 and NFPA 70.

C. Comply with NFPA 13 for installation of HVLS fans and maximum allowable fan diameter. Center HVLS fans between four adjacent sprinklers. Minimum vertical clearance from HVLS fan to sprinkler deflector is 3 feet (0.9 m).

D. Comply with NFPA 72 and interlock HVLS fans to shut down upon receiving an alarm from fire alarm system.

E. Equipment Mounting:

1. Anchor fan to building structure with manufacturer's recommended mounting bracket for installed condition.
2. Consult a licensed professional structural engineer for mounting methods and approval for mounting to the structure. Structure must be able to withstand the torque and forces generated by the fan.
3. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
4. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
5. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

F. Install unit to permit access for maintenance.

G. Install parts and accessories shipped loose.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
   1. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

E. Install power wiring to field-mounted electrical devices, furnished by fan manufacturer, but not factory mounted.

3.4 CONTROL CONNECTIONS

A. Connect control wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

C. Connect control interlock wiring between HVLS fan and other equipment to provide a complete and functioning system.

D. Connect control wiring between fan unit control interface and control system to provide remote control and monitoring.

E. Install control devices furnished by manufacturer, but not factory mounted.

F. Install control wiring to field-mounted control devices, furnished by fan manufacturer, but not factory mounted.

G. Protect installed units from damage caused by other work.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

   1. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Fan or components will be considered defective if fan or components do not pass tests and inspections.

D. Prepare and submit test and inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Verify that fan is secure on mountings and supporting devices and that connections to electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers and switches.
3. Verify proper motor rotation direction and free fan rotation.
4. Verify proper fan rotation. Set rotation selector to blow vertically downward during heating season, and vertically upward during cooling season.

3.7 ADJUSTING

A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.8 CLEANING

A. Clean equipment externally; remove coatings applied for protection during shipping and storage, foreign material, and oily residue in accordance with manufacturer's written instructions. Following manufacturer's cleaning procedures, and clean with manufacturer-recommended cleaning products.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVLS fans.

END OF SECTION 16334

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Retain subparagraph below if final system short-circuit and coordination studies will be performed by the designer or will be assigned to an independent consultant. These curves are also beneficial to Owner for future additions or reevaluations of settings of overcurrent protective devices. Although some manufacturers no longer offer curves on translucent graph paper, curves can normally be downloaded from manufacturers' Web sites or be obtained, in electronic form, from various coordination software vendors as part of a subscription service. Retain option in subparagraph below only if manufacturers selected offer

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).

2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250, Type 4X,.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 16 Section "Electrical Identification."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 16410

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.
4. Electronic-grade panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 PERFORMANCE REQUIREMENTS

1.5 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.8 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.9 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.
    c. Kitchen Areas: NEMA 250, Type 4X,.
    d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
    e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:

    a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.

6. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus: Vertical buses divided into individual vertical sections.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Compression type.
3. Ground Lugs and Bus-Configured Terminators: Compression type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

2.4 ELECTRONIC-GRADE PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1; with factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment and isolated ground buses.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Division 3 Section "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section"Electrical Identification."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 16 Section "Overcurrent Protective Device Coordination."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 16442

SECTION 16461 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.
2. Buck-boost transformers.

1.3 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Source quality-control test reports.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Products.
2. General Electric Company.
3. Siemens Energy & Automation, Inc.
4. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Division 16 Section "Electrical Supports and Seismic Restraints."

C. Cores: One leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

G. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

H. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

I. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 16 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Division 16 Section "Electrical Supports and Seismic Restraints."

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

E. Remove and replace units that do not pass tests or inspections and retest as specified above.

F. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower

than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 16461

SECTION 16491 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Coordination charts and tables and related data.
5. Fuse sizes for elevator feeders and elevator disconnect switches.

B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Coordination charts and tables and related data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

2.5 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay.
2. Feeders: Class L, time delay.
3. Motor Branch Circuits: Class RK1, time delay.
4. Other Branch Circuits: Class RK1, time delay.
5. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.

C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 16 Section "Electrical Identification" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 16491

SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.
5. Retrofit kits for fluorescent lighting fixtures.

B. Related Sections include the following:

1. Division 13 Section "Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
2. Division 16 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
3. Division 16 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
4. Division 16 Section "Stage Lighting" for theatrical lighting fixtures and their controls.
5. Division 16 Section "Dimming Controls" for architectural dimming systems.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

G. RCR: Room cavity ratio.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast.
4. Energy-efficiency data.
5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 15 Section "Diffusers, Registers, and Grilles."
6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 15 Section "Diffusers, Registers, and Grilles."
7. Life, output, and energy-efficiency data for lamps.
8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

1. Wiring Diagrams: Power and control wiring.

C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Access panels.

5. Perimeter moldings.

D. Samples for Verification: Interior lighting fixtures designated for sample submission in Interior Lighting Fixture Schedule. Each sample shall include the following:

1. Lamps: Specified units installed.

2. Accessories: Cords and plugs.

E. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

F. Qualification Data: For agencies providing photometric data for lighting fixtures.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

E. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
2. Warranty Period for Emergency Fluorescent Ballast Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

C. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: One year(s) from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Battery and Charger Data: One for each emergency lighting unit.
4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings. Contractors wishing to submit alternate equipment shall submit to the specifying authority, at least 10 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Transient Voltage Protection: IEEE C62.41, Category A or better.
4. Operating Frequency: 20 kHz or higher.
5. Lamp Current Crest Factor: 1.7 or less.
6. BF: 0.85 or higher.
7. Power Factor: 0.98 or higher.
8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.

C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

D. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.

3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
11. Ballast Case Temperature: 75 deg C, maximum.

B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate 1 fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Night-Light Connection: Operate one fluorescent lamp continuously.
3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Night-Light Connection: Operate one fluorescent lamp in a remote fixture continuously.
3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type.
5. Housing: NEMA 250, Type 1 enclosure.

6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.6 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F (40 deg C).
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Sound Rating: A.
3. Total Harmonic Distortion Rating: Less than 15 percent.
4. Transient Voltage Protection: IEEE C62.41, Category A or better.
5. Lamp Current Crest Factor: 1.5 or less.
6. Power Factor: .90 or higher.
7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
8. Protection: Class P thermal cutout.
9. Retain subparagraph and associated subparagraphs below for bi-level ballasts.

2.7 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.

c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

4. Master/Remote Sign Configurations:

a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

2.8 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.

C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000 K, and average rated life of 20,000 hours, unless otherwise indicated.

E. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).

5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.9 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.

1. Dual-Arc Tube Lamps: Arranged so only one of two arc tubes is lighted at one time and, when power is restored after an outage, the cooler arc tube, with lower internal pressure, lights instantly, providing an immediate 8 to 15 percent of normal light output.

B. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65, and color temperature 4000 K.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

D. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80, and color temperature 4000 K.

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Electrical Supports and Seismic Restraints" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

D. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

E. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.

2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust aimable lighting fixtures to provide required light intensities.

F. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16511

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.
B. Removal of existing debris.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2200 - Grading

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 7000.
B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
B. Protect existing utilities to remain from damage.
C. Do not disrupt public utilities without permit from authority having jurisdiction.
D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by site improvements, paving, playing fields, lawns, and planting beds.
B. Do not begin clearing until vegetation to be relocated has been removed.
C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
    1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
    2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 36 inches.
    3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
    4. Fill holes left by removal of stumps and roots, using suitable fill material, compacted to 95 percent standard procotor density, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.
G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to UHS.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.
B. Leave site in clean condition, ready for subsequent work.
C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 1101
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK

A. Cleaning and grubbing on project site of trees, stumps, brush, roots, vegetation, logs rubbish and other objectionable matter within limits described in specifications or as shown on plans.
B. Cleaning and grubbing shall be in advance of grading operation except that in cuts over 3 feet in depth, grubbing may be done simultaneously with excavation, provided objectionable matter is removed as specified.
C. Disposal of all debris resulting from clearing and grubbing work.
D. PROTECTION OF ADJACENT WORK:
E. Protect all areas outside indicated construction areas.
F. Protect existing improvements, adjacent property, utilities and other facilities, and trees and plants not to be removed from injury or damage.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials required to perform work as specified.

PART 3 - EXECUTION

3.01 CLEARING:

A. Clear all areas covered by dikes, roads, structures and embankments within project limits unless otherwise shown in plans.
B. Remove all saplings, brush, down-timber and debris unless shown or directed otherwise.
C. Use tree wound paint to treat scars, gashes or limbs stubs on trees not removed.
D. GRUBBING:
E. Trees, stumps, root systems, rocks and other obstructions shall be removed to the depths shown when they fall within the construction templates for the following items:
   1. Footings 18-inches below bottom of footing (or as specified on
   2. Sidewalks (or other types of walks 12-riches below bottom of walk.
   3. Roadways or Streets 18-inches below bottom of sub-grade
   4. Parking Areas 18-inches below bottom of sub-grade
   5. Grassed Areas 18-inches below topsoil
   6. Fills 24-inches below bottom of fill
F. Blasting not permitted.
G. REMOVAL OF DEBRIS AND CLEANUP
H. Dispose of all waste materials not burned by removal from site. Disposal of all materials deemed unsalvageable by the CONTRACTOR shall be disposed at a State of Texas Permitted Disposal Site.
I. Materials cleared and grubbed shall be the property of the Contractor and shall be his responsibility for disposal.
J. CLEARING AND GRUBBING:
K. When not listed as separate contract pay item, Clearing and Grubbing shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided in the proposal contract.
L. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor equipment, tools and in incidentals required for the work, all in accordance with the plans and these specifications.

END OF SECTION

SECTION 31 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal and storage of topsoil.
B. Rough grading the site for site structures, building pads, and site work to the limits as shown in the plans.
C. Finish grading for planting.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.
B. Section 31 2316 - Excavation.
C. Section 31 2316.13 - Trenching: Trenching and backfilling for utilities.
D. Section 31 2316.26 - Rock Removal.
E. Section 31 2323 - Fill: Filling and compaction.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Texas, Highway Department standards.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.
C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
D. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
E. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
F. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
B. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
C. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
D. When excavating through roots, perform work by hand and cut roots with sharp axe.
E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 FINISH GRADING

A. Before Finish Grading:
    1. Verify building and trench backfilling have been inspected.
    2. Verify subgrade has been contoured and compacted.
B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
C. Where topsoil is to be placed, scarify surface to depth of 4 inches.
D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
E. Place topsoil in areas where seeding are indicated.
F. Place topsoil in areas indicated.
G. Place topsoil to thickness as scheduled.
H. Place topsoil to the following compacted thicknesses:
    1. Areas to be Seeded with Grass: 6 inches.

2. Areas to be Sodded: 4 inches.
3. Shrub Beds: 18 inches.
4. Flower Beds: 12 inches.
5. Planter Boxes: To within 3 inches of box rim.

I. Place topsoil during dry weather.
J. Remove roots, weeds, rocks, and foreign material while spreading.
K. Near plants spread topsoil manually to prevent damage.
L. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
M. Lightly compact placed topsoil.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.06 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Engineer as to remedy.
C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size as directed by Engineer.

3.07 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.
B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316.10
EXCAVATION – CIVIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Section 01 5713 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.
B. Section 31 2200 - Grading: Soil removal from surface of site.
C. Section 31 2200 - Grading: Grading.
D. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
E. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.
F. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 SUBSIDIARY TO PROJECT COST

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for excavation.

1.05 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 3 EXECUTION

2.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. See Section 31 2200 for additional requirements.
C. Locate, identify, and protect utilities that remain and protect from damage.
D. Notify utility company to remove and relocate utilities.
E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
F. Protect plants, lawns, rock outcroppings, and other features to remain.

2.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
C. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.
D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
E. Do not interfere with 45 degree bearing splay of foundations.
F. Cut utility trenches wide enough to allow inspection of installed utilities.
G. Hand trim excavations. Remove loose matter.
H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
I. Grade top perimeter of excavation to prevent surface water from draining into excavation.
J. Remove excavated material that is unsuitable for re-use from site.
K. Remove excess excavated material from site.

2.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

2.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2316.14
TRENCH PROTECTION SYSTEM

PART 1 - GENERAL

1.01GENERAL DESCRIPTION OF WORK

A. This work shall consist of shoring, bracing, bank stabilization, bank sloping, providing trench boxes or trench shields or other equivalent means to protect employees from the effects of moving ground or cave-ins for all trenches 5-feet or more in depth.

B. All work shall be done in conformance with OSHA Safety and Health Standards (29 CFR 1926/1010 Chapter XVII Subpart P-Excavations, Trenching and Shoring.).

C. DEFINITIONS APPLICABLE TO THIS SPECIFICATION

D. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required a Registered Professional Engineer, or other duly licensed or recognized authority.

E. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.

F. "Bank" - A mass of soil rising above a digging level.

G. "Belled excavation" - A part of shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.

H. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.

I. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.

J. "Faces" - See paragraph (k) of this section.

K. "Hard compact soil" - All earth materials not classified as running or unstable.

L. "Kickouts" - Accidental release or failure of a shore or brace.

M. "Sheet pile" - A pile, or sheeting, that may form one of the continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.

N. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.

O. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.

P. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.

Q. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 ft.

R. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

S. "Unstable soil" - Earth material, other than running, that because of its nature of the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

T. "Uprights" - the vertical members of a shoring system.

U. "Wales" - See paragraph M of this section.

V. "Walls" - See paragraph K of this section.

PART 2 - PRODUCTS

2.01NO INFORMATION FOR THIS SECTION

PART 3 - EXECUTION

3.01GENERAL PROTECTION REQUIREMENTS

A. Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.
B. If planks are used for raised walkways, runways, or sidewalks they shall be laid parallel to the length of the walk and fastened together against displacement.
C. Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.
D. Raised walkways, runways, and sidewalks shall be provided with plank steps on string stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.
E. All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet and other parts of the body as set forth in OSHA Standards.
F. Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made or reflectorized with high visibility material.
G. Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in OSHA Standards.
H. No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage, employees shall be required to stand away from any vehicle being loaded.
I. Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard employees.
J. SPECIFIC EXCAVATION REQUIREMENTS
K. Prior to opening an excavation, effort shall be made to determine whether underground installations, i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.
L. Trees, boulders, and other surface encumbrances, located so as to create a hazard employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed o made safe before excavating is begun.
M. The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground or some other equivalent means.
N. Excavations shall be inspected by a competent person after ever rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
O. The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying materials, or stored material; and vibration from equipment, blasting, traffic, or other sources.
P. Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.
Q. All slops shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.
R. The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas were erosion deep frost action and slide planes appear.

S. Clearances:
   1. In excavations which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2-feet or more from the edge of the excavation.
   2. As an alternative to the clearance prescribed in subparagraph 1, the Contractor may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.

T. Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

U. Support systems shall be planned and designed by a qualified person when excavation is in excess of 20-feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.

V. Materials used for sheeting, sheet piling, cribbing, bracing, shoring and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.

W. Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to previously backfilled excavation for a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.

X. Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall in underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.

Y. If the stability of adjoining building or walls is endangered by excavations, shoring, bracing or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person the protection effectively maintained.

Z. Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

AA. If it is necessary to place or operate power shovels, derricks, trucks, excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

AB. Blasting and the use of explosives are not allowed unless authorized in other portions of the specifications.

AC. When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. if possible, the grade should be away from the excavation.

AD. Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc. shall be backfilled.

AE. If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.

AF. In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in OSHA Standards shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc. shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.

AG. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

AH. Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.

AI. All ladders used on excavation operations shall be in accordance with requirements of OSHA Standards.

AJ. SPECIFIC TRENCHING REQUIREMENTS

AK. Banks more than 5-feet shall be shored, laid back to a stable slope or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Trenches less that 5-feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

AL. Sides of trenches in unstable or soft material, 5-feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them.

AM. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5-feet in depth and 8-feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level many be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6-feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.

AN. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

AO. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

AP. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier and securely fastened to shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.

AQ. Minimum requirements for trench timbering shall be in accordance with Table 19000-1. Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stresses in excess of values given by the following formula:

1. S + 1300 - 20L
    a. Maximum L = 50
    b. Ratio D
2. Where:
3. Length, unsupported, inches
4. Least side of the timber in inches
5. Allowable stress in pounds per square inch of cross-section.

AR. When employees are required to be in trenches 4-feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25-feet of lateral travel.

AS. Bracing or shoring of trenches shall be carried along with the excavation.

AT. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

AU. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench. The Contractor shall provide a statement certified by a Registered Professional Engineer of the adequacy of trench boxes or shields.

AV. Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

AW. CONSTRUCTION REQUIREMENTS

AX. The Contractor unless provided for in the plans otherwise shall provide the minimum shoring shown in Table 19000-1 for the soil class noted in the plans.

AY. Should the soil conditions differ form those specified or should ground water be encountered int eh excavation the contractor shall notify the Engineer immediately. The Contractor shall refrain from operating in that portion of the trench where changed conditions are noted until such time as an

inspection of conditions takes place and the contractor is notified of measures necessary for continued operation.

AZ. The Contractor shall prepare and submit a plan of operation. This plan of operation shall identify material, equipment, methods and installation and shall be inspected by a Registered Professional Engineer. The Contractor's Engineer shall certify the adequacy of the trench protection system and its adherence of OSHA Standards.

BA. PART 4- MEASUREMENT AND PAYMENT

BB. MEASUREMENT

BC. Providing shoring in trenches or other alternate means in accordance with this specification shall be measured by the linear foot of trench of specified sizes or sizes of pipe in ranges of depth to the invert elevation of the pipe or structure. Additional depth for foundations, etc. shall be considered incidental to the price bid for the protection.

BD. The Contractor shall provide shoring systems for construction of structures 5-feet or greater in depth. There will be no direct payment for these systems but it shall be considered incidental to the price bid for the structure.

BE. PAYMENT

BF. Trench protection shall be full compensation for providing acceptable shoring or other alternate means, installing, inspecting, certifying and maintaining the shoring and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work.

BG. SEE ATTACHED TABLE

END OF SECTION

SECTION 31 2316.15
TRENCHING – CIVIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document Obtain from Owner's Representative Project Administrator: Geotechnical report; bore hole locations and findings of subsurface materials.
B. All excavation is unclassified.
C. Trench dewatering: Contractor is responsible for dewatering and trench stabilization with geotextile or other approved methods to allow for proper bedding and sidewall Trench conditions for proper pipe installation. No separate payment shall be made to the contractor for such work, but shall be subsidiary to the total project cost.
D. Section 31 2200 - Grading: Site grading.
E. Section 31 2316 - Excavation: Building and foundation excavating.
F. Section 31 2316.26 - Rock Removal: Removal of rock during excavating.
G. Section 31 2323 - Fill: Backfilling at building and foundations.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for earthwork.
B. Subsidiary to the Utility Work related to the Project.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.
B. Subgrade Elevations: 4 inches below finish grade elevations indicated on drawings, unless otherwise indicated in landscaping plans whichever is greater.

1.05 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010
B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2007.
C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2009.
E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2010.
G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
I. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Materials Sources: Submit name of imported materials source.
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
D. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where indicated.
    1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
    2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type as specified in plan details.: Conforming to State of Texas Highway Department standard.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. See Section 31 2200 for additional requirements.
C. Locate, identify, and protect utilities that remain and protect from damage.
D. Notify utility company to remove and relocate utilities.
E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
F. Protect plants, lawns, rock outcroppings, and other features to remain.

3.03 TRENCHING

A. Notify Engineer Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
C. Do not interfere with 45 degree bearing splay of foundations.
D. Cut trenches wide enough to allow inspection of installed utilities.
E. Hand trim excavations. Remove loose matter.
F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
G. Remove excavated material that is unsuitable for re-use from site.
H. Remove excess excavated material from site.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.
D. Apply the granular bedding material as specified for pressure pipe or gravity pipe as specified and shown on the plan details.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.
B. Fill up to subgrade elevations unless otherwise indicated.
C. Employ a placement method that does not disturb or damage other work.
D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
H. Correct areas that are over-excavated.
    1. Thrust bearing surfaces: Fill with concrete.
    2. Other areas: Use general fill, flush to required elevation, compacted to minimum 98 percent of maximum dry density.
I. Compaction Density Unless Otherwise Specified or Indicated:
    1. Under paving, slabs-on-grade, and similar construction: 98 percent of maximum dry density.

2. At subgrade: 98 percent of maximum dry density.
3. At other locations: 98 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.
K. Water jetting is not permissible.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.
B. Utility Piping and Conduits :
   1. Bedding: Use Fill Type as specified in bedding detail.
   2. Cover with Fill Type as specified in bedding detail.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 6 inch lifts to 95 percent of maximum dry density.
C. At Storm Sewer Inlets:
   1. Use Fill Type select.
   2. Fill 8 inches deep.
   3. Fill up to subgrade elevation.
   4. Maximum compacted depth of each lift: 6 inches.
   5. Compact to 95 percent of maximum dry density.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.
B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations (subgrade elevations).

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D3017, or ASTM D6938.
C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.
D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
E. Frequency of Tests: as determined by Owner.
F. All re-tests shall be paid for by the Contractor.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for paving, site structures, and site inside project limts as required to acquire final grade elevation.
B. Backfilling and compacting for utilities outside the building to utility main connections.
C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical engineering report. A copy can be obtained with owner's representative project administrator.: Geotechnical report; bore hole locations and findings of subsurface materials including approved fill materials.
B. Section 31 2200 - Grading: Site grading.
C. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.
D. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.03 PRICE AND PAYMENT PROCEDURES

A. Shall be Subsidiary to the Project Cost.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated in drawings.
B. Subgrade Elevations: 4 inches below finish grade elevations indicated on drawings, unless otherwise indicated.

1.05 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
J. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
C. Materials Sources: Submit name of imported materials source.
D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
E. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where indicated.
    1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
    2. Prevent contamination.
    3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site and clean of organic material or other debris deemed unsuitable, or material hauled in to the site having a maximum PI of 16. When material is hauled in for fill, the material classification must be of the same type as existing to provide a uniform hogeneous subgrade foundation.
   On-Site Clay Fill: If on-site clay fill is utilized as backfill, material shall be placed as recommended on geotechnical engineering study produced by Geotechnical Engineer.
   Select Fill: As recommended on geotechnical engineering study.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
C. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
D. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.
B. Identify required lines, levels, contours, and datum locations.
C. See Section 31 2200 for additional requirements.

3.02 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.
B. Fill up to subgrade elevations unless otherwise indicated.
C. Employ a placement method that does not disturb or damage other work.
D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.
G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
H. Slope grade away from building minimum 2 inches in 10 ft areas near pedestrian access routes, all other areas grade away from the building at 6 inches in 10 feet or as shown in the plans . Make gradual grade changes. Blend slope into level areas.
I. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density ASTM D648.
J. Compaction Density Unless Otherwise Specified or Indicated:
K. Reshape and re-compact fills subjected to vehicular traffic.
L. Refer to geotechnical engineering study AMA13-014-00 produced by Raba Kistner Consultants Inc. for additional information.

3.03 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated in geotechnical report.

3.04 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.
C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
D. Frequency of Tests: as determined by the Owner.

3.06 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
B. Leave unused materials in a neat, compact stockpile.
C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
D. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 3213.19
LIME SOIL STABILIZATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating, treatment, and placement of lime treated subsoil mix.

1.02 RELATED REQUIREMENTS

A. Section 31 2316 - Excavation: General site and building excavation.
B. Section 31 2316.13 - Trenching: Backfilling of utility trenches.
C. Section 31 2316.26 - Rock Removal.
D. Section 31 2323 - Fill: General site and building backfilling.
E. Section 31 2323 - Fill: Soil and aggregate materials.

1.03 PRICE AND PAYMENT PROCEDURES

A. Subsidiary to the Project Cost for the percent by weight application as indicated on the plans.

1.04 REFERENCE STANDARDS

A. AASHTO M 216 - Standard Specification for Lime for Soil Stabilization; 2005.
B. ASTM C977 - Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization; 2010.
C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
F. NLA Bull 326 - Lime-Treated Soil Construction Manual: Lime Stabilization & Lime Modification; 2004, 11th Edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Submit mix design and materials mix ratio that will achieve specified requirements.
C. Samples: Submit 10 lb sample of each type of fill in air-tight containers, to testing laboratory.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with Item 260 of the 2004 State of Texas Highways standards.

1.07 FIELD CONDITIONS

A. Do not install mixed materials in wind in excess of 20 mph or when temperature is below 40 degrees F.

PART 2 PRODUCTS

2.01 MIX MATERIALS

A. Coarse Aggregate: Granular fill specified in Section 31 2323.
B. Fine Aggregate: Sand fill specified in Section 31 2323.
C. Subsoil: General fill specified in Section 31 2323.
D. Subsoil: Existing reused.
E. Lime: AASHTO M 216 hydrated lime.

2.02 EQUIPMENT

A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, and compaction of material.

2.03 LIME/SOIL MIX

A. Mix materials in accordance with State of Texas Highways standard.
B. Carefully add water to the mix to achieve a consistent mixture without lumping yet not create a wet plastic consistency.
C. Obtain approval of the mix by Owner before proceeding with placement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place fill over frozen or spongy subgrade surfaces.

3.02 EXCAVATION

A. Protect adjacent structures from damage by this work.

B. Excavate subsoil to a depth sufficient to accommodate soil stabilization, construction operations, and compaction.
C. Proof roll subgrade to identify soft areas; excavate those areas.
D. Do not excavate within normal 45 degree bearing splay of any foundation.
E. Notify Engineer Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume work.
F. Correct areas over-excavated in accordance with Section 31 2316.

3.03 SOIL TREATMENT AND BACKFILLING

A. Site mix subsoil, backfill and compact. Blend treated subsoil mix to achieve mix formulation and required stabilization.
B. Mix and wait 16 hours minimum and no more than 72 hours maximum before placing.
C. Place mix material in continuous layers not exceeding 12 inches depth.
D. Maintain optimum moisture content of mix materials to attain required stabilization.
E. Do not exceed 30 minutes in placing adjacent mixed material.
F. Commence compaction of mix no later than 60 minutes after placement.
G. Compact to 95 percent of maximum density determined in accordance with ASTM D 698; test in-place density in accordance with ASTM D1556.
H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
I. Shape to required line, grade, and cross section.
J. Make grade changes gradual. Blend slope into level areas.
K. At end of day, terminate completed Work by forming a straight and vertical construction joint.
L. Replace damaged fill with new mix to full depth of original mix.
M. Remove surplus mix materials from site.

3.04 CURING

A. Immediately following compaction of mix, seal top surface with curing seal.
B. Do not permit traffic for 72 hours after sealing top surface.

3.05 TOLERANCES

A. Top Surface of Fill: Plus or minus one inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 4000.
B. Compression test and analysis of hardened fill material will be performed in accordance with ASTM D 698.
C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
D. Frequency of Tests: as directed by Owner.

END OF SECTION

SECTION 31 3700
RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap .

1.02 RELATED REQUIREMENTS

A. Section 31 2323 - Fill: Aggregate requirements.

1.03 PRICE AND PAYMENT PROCEDURES

A.

B. See Section 01 2200 - Unit Prices, for additional unit price requirements.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with 2004 TxDOT Standard Specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Provide in accordance with Item 432 of 2004 TxDOT Standard Specifications.

B. Aggregate: Granular fill as specified in Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, and as indicated.

END OF SECTION

SECTION 32 1123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.
B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for base course.
B. Section 31 2316.13 - Trenching: Compacted fill over utility trenches under base course.
C. Section 31 2323 - Fill: Topsoil fill at areas adjacent to aggregate base course.
D. Section 31 2323 - Fill: Compacted fill under base course.
E. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.
F. Section 32 1313 - Concrete Paving: Finish concrete surface course.
G. Section 33 0513 - Manholes and Structures: Manholes including frames.

1.03 PRICE AND PAYMENT PROCEDURES

A. Subsidiary to Project Cost
B. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.04 REFERENCE STANDARDS

A. TxDOT Item 247, Flexible Base, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 edition.
B. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).
C. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
D. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
F. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
G. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
H. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
I. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.
L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
C. Materials Sources: Submit name of imported materials source.
D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
E. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. Aggregate Storage, General:
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Refer to Civil Site Standard Details for Specifications.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.
C. If tests indicate materials do not meet specified requirements, change material and retest.
D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.
B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. To the thickness and compaction as specified in the Plans.
B. Place aggregate in maximum 4 inch layers and roller compact to specified density.
C. Level and contour surfaces to elevations and gradients indicated.
D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
B. Scheduled Compacted Thickness: Within 1/4 inch.
C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.
C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").
D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
E. Frequency of Tests: as determined by owner.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.
B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 GENERAL

Asphalt paving shall be provided in accordance with the **compacted** thickness specified for the use category indicated and in accordance with this Specification and as further shown in the Typical Detail Section of the Site-Civil Plans.

1.01 SECTION INCLUDES
A. Aggregate base course.
B. Single course bituminous concrete paving.
C. Surface sealer.

1.02 RELATED REQUIREMENTS
A. Section 31 2200 - Grading: Preparation of site for paving and base.
B. Section 31 2323 - Fill: Compacted subgrade for paving.
C. Section 32 1123 - Aggregate Base Courses: Aggregate base course.
D. Section 33 0513 - Manholes and Structures: Manholes, including frames; gutter drainage grilles, covers, and frames for placement by this section.
E. Section 09 9000 - Painting and Coating: Pavement markings.

1.03 PRICE AND PAYMENT PROCEDURES
A. Subsidiary to Project Cost
B. Asphalt Pavement Mix (Binder Course): By the ton. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.
C. Asphalt Pavement Mix (Wearing Course): By the ton. Includes preparing base, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.
D. Seal Coat: By the square yard. Includes preparing surfaces and applying.

1.04 REFERENCE STANDARDS

1.05 TXDOT ITEM 300 ASPHALTS, OILS AND EMULSIONS (STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES; 2014 EDITION)

1.06 TXDOT ITEM 301 ASPHALT ANTI-STRIPPING AGENTS (STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES; 2014 EDITION)

1.07 TXDOT ITEM 310 ANTI-STRIPPING AGENTS (STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES; 2014 EDITION)

1.08 TXDOT ITEM 340 DENSE-GRADED HOT-MIX ASPHALT (STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES; 2014 EDITION)

1.09 TXDOT ITEM 300 ASPHALTS, OILS AND EMULSIONS (STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES; 2014 EDITION)
A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 1997.
B. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.
C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.10 QUALITY ASSURANCE
A. Perform Work in accordance with 2014 TxDOT Standard Specifications.
B. Mixing Plant: Conform to 2014 TxDOT Standard Specifications.
C. Obtain materials from same source throughout.

1.11 FIELD CONDITIONS
A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS
A. Asphalt Cement: ASTM D 946.
B. Hot Mix Surface Course with Lime Stone Aggregate and Fillers , TxDoT Type D, Item 340 compacted to a minimum of 92% SPD.

C. Aggregate for Base Course: In accordance with 2014 TxDOT Standard Specifications Type B Grade 3, item 247 compacted to a minimum of 98% SPD, ASTM D-698 with 1.5% lime by weight.
D. Stabilized Subgrade: General Fill material compacted to 95% SPD and stabilized with 3% lime by weight to the thickness specified on the plans.
E. Aggregate for Binder Course: 2014 TxDOT Standard Specifications.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
B. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI ____.
C. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
D. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Place and compact base course.
B. See Section 32 1123.

3.03 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.
B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.
C. Apply primer to contact surfaces of curbs, gutters, and valley gutters.
D. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.
B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.
C. Apply tack coat to contact surfaces of curbs, gutters and valley gutters.
D. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of Texas Highways standards.
B. Place asphalt within 24 hours of applying primer or tack coat.
C. Place to 1 1/2" inch compacted thickness.
D. Install gutter drainage grilles and frames in correct position and elevation.
E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 SEAL COAT

A. Apply seal coat to surface course and asphalt curbs in accordance with AI MS-19.

3.07 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
C. Variation from True Elevation: Within 1/2 inch.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.
B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.09 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 5 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas, and roads.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.
B. Section 03 2000 - Concrete Reinforcing.
C. Section 03 3000 - Cast-in-Place Concrete.
D. Section 07 9005 - Joint Sealers: Sealant for joints.
E. Section 09 9113 - Exterior Painting: Pavement markings.
F. Section 31 2200 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.
G. Section 32 1416 - Brick Unit Paving.
H. Section 33 0513 - Manholes and Structures: Manholes, including frames; gutter drainage grilles, covers, and frames for placement by this section.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 REFERENCE STANDARDS

A. TxDOT Item 360, Concrete Pavement, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2004 edition.
B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
D. ACI 305R - Hot Weather Concreting; 2010.
E. ACI 306R - Cold Weather Concreting; 2010.
F. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
G. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.
H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
L. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
M. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
O. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
R. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
S. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
T. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.
B. Concrete Sidewalks and Median Barrier: 3,000 psi 28 day concrete, 4 inches thick, buff color Portland cement, exposed aggregate finish.
C. Parking Area Pavement: 4,000 psi 28 day concrete, 5 inches thick, 6 by 6 - W2.9 by W2.9 mesh reinforcement, wood float finish.

2.02 FORM MATERIALS

A. As Specified in Item 360, Concrete Pavement, TxDOT Standard Specifications 2014 edition.
B. Form Materials: As specified in Section 03 1000, conform to ACI 301.
C. Silicon Joint Filler as approved by Engineer.

2.03 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 2000.
B. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished.
C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.04 CONCRETE MATERIALS

A. Provide concrete materials in accordance with Item 421 TxDOT 2004 Standard Specifications.
B. Concrete Materials: As specified in Section 03 3000.

2.05 ACCESSORIES

A. Acid Etch Solution: Muriatic type mixed to a concentration recommended by ACI percent solution.
B. Liquid Surface Sealer: as approved by Engineer.

2.06 CONCRETE MIX DESIGN

A. Mix design in accordance with Item 421 TxDOT 2004 Standard Specifications.
B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
    1. For trial mixtures method, employ independent testing agency acceptable to Engineer Engineer for preparing and reporting proposed mix designs.
D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
E. Concrete Properties:
    1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; _____ psi.
    2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
    3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
    4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
    5. Cement Content: Minimum 810 lb per cubic yard.
    6. Water-Cement Ratio: Maximum 40 percent by weight.
    7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
    8. Maximum Slump: 3 inches.
    9. Maximum Aggregate Size: 1 inch.

2.07 MIXING

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. See Section 32 1123 for construction of base course for work of this Section.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.
B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

A. Place dowels to achieve pavement and curb alignment as detailed.
B. Provide doweled joints 12 inch on center at transverse joints.

3.05 PLACING CONCRETE

A. Ensure reinforcement, inserts, embedded parts, formed joints and ____ are not disturbed during concrete placement.
B. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
C. Place concrete to the specified pattern.

3.06 JOINTS

A. Align curb, gutter, and sidewalk joints.
B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
    1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
    2. Secure to resist movement by wet concrete.
C. Provide scored joints.
    1. At 3 feet intervals.
    2. Between sidewalks and curbs.
    3. Between curbs and pavement.
D. Provide keyed joints as indicated.
E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.07 JOINT SEALING

A. Silicone Joint Sealant Required

3.08 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
B. Maximum Variation From True Position: 1/4 inch.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
    1. Provide free access to concrete operations at project site and cooperate with appointed firm.
    2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
    3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
    1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
    2. Perform one slump test for each set of test cylinders taken.
C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.
C. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

3.11 SCHEDULES

A. shop drawing submittal for mix design, joint patterns, joint fillers and all other materials required for construction: _____.

END OF SECTION

SECTION 32 1600.01
CONCRETE CURB AND GUTTER AND VALLEY GUTTER

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. This work shall consist of the construction of concrete curb, edge curb, concrete curb and gutter, concrete gutter or valley gutter, or combination thereof in compliance with these specifications, lines, grades, concrete strength and details shown on the plans, or as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Concrete and manufactured curb and gutter materials shall be subject to inspection and tests at plants and construction sites for compliance with quality requirements.
B. Concrete curb and gutter or concrete valley gutter shall be constructed with concrete conforming to the provisions of Section 03300 - Cast-In-Place Concrete.
C. Preformed expansion Joint Filler shall conform to the requirements of AASHTO M-33 or M-153.
D. Linseed Oil shall conform to the requirements of AASHTO D-260.
E. Mineral Spirits shall conform to the requirements of AASHTO D-235.

2.02 FOUNDATION:

A. Concrete curb and gutter or concrete valley gutter shall be placed on an approved foundation conforming to the requirements of the following Specifications:
   1. TxDOT ITEM 247 - Flexible Base,

PART 3 - EXECUTION

3.01 EXCAVATION:

A. When required, excavation shall be made to the specified depth, and the base upon which the curb and gutter or valley gutter is to be placed shall be compacted to a firm, even surface conforming to the requirements of Subsection 2.02 above.
B. All soft and unacceptable material shall be removed and replaced with material approved by the ENGINEER in conformance with the requirements of Subsection 2.02 above.

3.02 FORMS:

A. Forms shall be of wood or metal, straight, free from warp, and of such construction that there will be no interference to the inspection of grade or alignment.
B. All forms shall extend for the entire depth of the curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placing of the concrete. Flexible forms shall be used in curved sections so that the top surface of the forms will form a smooth, continuous arc.

3.03 MIXING AND PLACING:

A. Concrete shall be proportioned, mixed, and placed in accordance with the requirements of Section 03300.
B. Compaction of the concrete placed in forms shall be by vibration or other acceptable methods.
C. Unless otherwise provided, the exposed surfaces of curbs and gutters shall be finished by belting or with wooden floats. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the curb and gutter.

3.04 SECTIONS:

A. Curb and Gutter or Edge Curb shall be constructed in sections having a uniform length of 20 feet, unless otherwise directed by the ENGINEER. Sections shall be separated by open joints 1/8 inch wide except at expansion joints.

3.05 EXPANSION JOINTS:

A. Expansion joints shall be formed at the intervals shown on the plans using a preformed expansion joint filler having a thickness of 3/4 inch.
B. When the curb and gutter is constructed adjacent to or on concrete pavement, expansion joints shall be located opposite or at expansion joints in the pavement.

3.06 CURING

A. Immediately upon completion of the finishing, the curb and gutter shall be moistened and kept moist for 3 days, or the curb and gutter shall be cured by the use of membrane-forming material. The method and details of curing shall be subject to the approval of the ENGINEER.

3.07 SURFACE TREATMENT:

A. The surface of concrete curb and gutter or concrete valley gutter shall be treated with a solution of Linseed Oil and Mineral Spirits in accordance with the applicable requirements of Section 03300 - Cast-In-Place Concrete.

3.08 BACKFILLING:

A. After the concrete has set sufficiently, the spaces in front and back of the curb shall be refilled to the required elevation with material approved by the ENGINEER, and shall be thoroughly tamped in layers of not more than 6 inches.

3.09 SLIP-FORM CONCRETE CURB, CONCRETE CURB AND GUTTER OR CONCRETE VALLEY GUTTER:

A. Any concrete curb or concrete curb and gutter, except on structures, may be placed using a slip form machine provided that the finished concrete curb or concrete curb and gutter is true to line and grade and the concrete is dense and of the required surface texture.

B. The concrete shall be of a consistency that it will maintain the shape of the concrete curb or concrete curb and gutter section without support after slip forming.

C. The top and face of the finished concrete curb or concrete curb and gutter shall be true and straight and the top surface of the concrete curb or concrete curb and gutter shall be of uniform width and free from humps, sags, or other irregularities.

D. The forming portion of the slip form machine shall be readily adjustable vertically during the forward motion of the slip from machine to provide a variable height of concrete curb or concrete curb and gutter grade when necessary. A grade line gauge or pointer shall be attached to the slip form machine in such a manner that a continual comparison can be made between the concrete curb or concrete curb and gutter grade as indicated by the offset guidelines.

E. Concrete shall be fed to the slip form machine at a uniform rate. The slip form machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a wet brush. Finishing with a brush application of grout will not be permitted.

F. Transverse weakened plane and expansion joints shall be constructed at right angles to the line of the concrete curb, concrete curb and gutter, or concrete valley gutter.

G. Expansion joints may be constructed by sawing through the concrete curb or concrete curb and gutter section to its full depth. The width of the cut shall be such as to admit the joint filler with a snug fit.

H. The operations of sawing and inserting the joint filler shall be completed before curing the concrete. At the conclusion of the curing period the filler in each joint shall be checked for tightness of fit. The loose filler in any joint shall be mortared in place and cured.

I. Excavation shall be as per Subsection 2.02 above.

J. All remaining provisions of Subsection 2.02 above also apply, unless otherwise specified.

K. PART 4 - MEASUREMENT AND PAYMENT

3.10 MEASUREMENT:

A. Curb and gutter, curb, and valley gutter shall be measured by the linear foot.
   1. Curb shall be measured along the front face of the section at the finished grade elevation.
   2. Combination curb and gutter will be measured along the face of the curb at the flowline of the gutter.
   3. Valley gutter will be measured along the flowline of the gutter.

B. A deduction in length shall be made for drainage structures, such as catch basins or inlets, in the curb, gutter, or combination thereof.

C. There will be no direct measurement or payment of materials used to construct curb and gutter, curb or valley gutter.

D. Excavation or construction of embankment for foundation of curb, valley gutter, or combination curb and gutter will not be measured for payment.

3.11 PAYMENT: Payment will be subsidiary to the total project cost.

END OF SECTION

SECTION 32 1723.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.
B. Roadway lane markings and crosswalk markings.
C. "No Parking" curb painting.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.
B. Section 32 1313 - Concrete Paving.

1.03 PRICE AND PAYMENT PROCEDURES

1.04 SUBSIDIARY TO PROJECT COST

A. See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.05 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.
B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.
C. Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges; 2004 Edition, Item 666 Reflectorized Pavement Markings

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.
C. Store products in manufacturer's unopened packaging until ready for installation.
D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. TxDOT Item 666, Type I "Hot Applied Thermoplastic"
   1. Roadway Markings: As per Drawing Details.
   2. Parking Lots: White.
   3. Handicapped Symbols: Blue.
B. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.
C. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.

END OF SECTION

SECTION 32 1723.14
ITEM 678 (TXDOT) - PAVEMENT SURFACE PREPARATION FOR MARKINGS

678.1. DESCRIPTION. PREPARE PAVEMENT SURFACE AREAS BEFORE PLACEMENT OF PAVEMENT MARKINGS AND RAISED PAVEMENT MARKERS. ITEM 677, "ELIMINATING EXISTING PAVEMENT MARKINGS OR MARKERS," GOVERNS COMPLETE REMOVAL OF EXISTING MARKINGS.

1.01 678.2. MATERIALS. USE A COMMERCIAL ABRASIVE-BLASTING MEDIUM CAPABLE OF PRODUCING THE SPECIFIED SURFACE CLEANLINESS. USE POTABLE WATER, WHEN WATER IS REQUIRED.

1.02 678.3. EQUIPMENT. FURNISH AND MAINTAIN EQUIPMENT IN GOOD WORKING CONDITION. USE MOISTURE AND OIL TRAPS IN AIR COMPRESSION EQUIPMENT TO REMOVE ALL CONTAMINANTS FROM THE BLASTING AIR AND PREVENT THE DEPOSITION OF MOISTURE, OIL, OR OTHER CONTAMINANTS ON THE ROADWAY SURFACE.

1.03 678.4. CONSTRUCTION. PREPARE PAVEMENT SURFACE OF SUFFICIENT AREA FOR THE PAVEMENT MARKINGS OR RAISED PAVEMENT MARKERS SHOWN ON THE PLANS. REMOVE ALL CONTAMINATION AND LOOSE MATERIAL. AVOID DAMAGING THE PAVEMENT SURFACE. WHEN EXISTING PAVEMENT MARKINGS ARE PRESENT, REMOVE LOOSE AND FLAKING MATERIAL. APPROVED PAVEMENT SURFACE PREPARATION METHODS ARE SWEEPING, AIR BLASTING, FLAIL MILLING, AND BLAST CLEANING UNLESS OTHERWISE SPECIFIED ON THE PLANS.

1.04 FOR CONCRETE PAVEMENT SURFACES, IN ADDITION TO THE ABOVE, AIR BLAST AFTER THE REMOVAL OF CONTAMINATION OR EXISTING MATERIAL AND JUST PRIOR TO PLACING THE STRIPE. PERFORM THE AIR BLASTING WITH A COMPRESSOR THAT IS CAPABLE OF GENERATING COMPRESSED AIR AT A MINIMUM OF 150 CFM AND 100 PSI USING 5/16-IN. OR LARGER HOSING FOR THE AIR BLAST.

1.05 CONTAMINANTS UP TO 0.5 SQ. IN. MAY REMAIN IF THEY ARE NOT REMOVED BY THE FOLLOWING TEST, PERFORMED JUST BEFORE APPLICATION OF MARKINGS:

A. Step 1. Air-blast the surface to be tested, to simulate blasting during application of markings.
B. Step 2. Firmly press a 10-in.-long, 2-in.-wide strip of monofilament tape onto the surface, leaving approximately 2 in. free.
C. Step 3. Grasp the free end and remove the tape with a sharp pull.
D. 678.5. Measurement. This Item will be measured by the foot for each width specified; by each word, shape, or symbol; or by any other unit except lump sum.

1.06 THIS IS A PLANS QUANTITY MEASUREMENT ITEM. THE QUANTITY TO BE PAID IS THE QUANTITY SHOWN IN THE PROPOSAL, UNLESS MODIFIED BY ARTICLE 9.2, "PLANS QUANTITY MEASUREMENT." ADDITIONAL MEASUREMENTS OR CALCULATIONS WILL BE MADE IF ADJUSTMENTS OF QUANTITIES ARE REQUIRED.

A. 678.6. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Pavement Surface Preparation for Markings" of the type and width as applicable. This price is full compensation for the cleaning method used, and equipment, materials, tools, labor, and incidentals.

END OF SECTION

SECTION 32 2262
GEOTEXTILE - SUBSURFACE DRAINAGE

PART 1. WORK INCLUDED

2.01 FURNISH LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO INSTALL GEOTEXTILE FABRIC. USE THE GEOTEXTILE IN SUBSURFACE DRAINAGE APPLICATIONS FOR LINING TRENCHES, PAVEMENT EDGE DRAINS, INTERCEPTOR DRAINS OR BLANKET DRAINS AS SPECIFIED. THE GEOTEXTILE SHALL BE DESIGNED TO ALLOW PASSAGE OF WATER WHILE RETAINING INSITU SOIL WITHOUT CLOGGING.

2.02 QUALITY ASSURANCE

A. DESIGN CRITERIA

1. The geotextile fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant, resistant to ultraviolet light exposure, insect and rodent resistant, and conform to the properties in the following table.

2. The average roll minimum value (weakest principal direction) for strength properties of any individual roll tested from the manufacturing lot or lots of a particular shipment shall be in excess of the average roll minimum value (weakest principal direction) stipulated herein.

Test Requirements:

Physical Properties	Average Roll Minimum Value (Weakest Principal Direction)*
Grab Tensile Strength* ASTM D4632	100
Elongation at Failure* ASTM D4632 (%)	20-100
Mullen Burst Strength ASTM D3786 (psi)	135
Permeability - k (1/sec ASTM D4491	1.0, min
Water Flow Rate (gal/min/ft) ASTM D4491	140-160

Physical Properties	Average Roll Minimum Value (Weakest Principal Direction)*
AOS(O95) mm, ASTM D4751	.15
Trapezoid Tear Strength* ASTM D4533 (Lbs).	40
Puncture Resistance ASTM D4833 (Lbs.)	45

B. PACKING AND IDENTIFICATION REQUIREMENTS
Provide the geotextile in rolls wrapped with protec-tive covering to protect the geotextile from mud, dirt, dust, and debris. The geotextile shall be free of defects or flaws which significantly affect its physical properties. Label each roll of geotextile in the shipment with a number or symbol to identify that production run.

C. SAMPLING AND COMPLIANCE REQUIREMENTS
A competent laboratory must be maintained by the producer of the geotextile at the point of manufacture to insure quality control in accordance with ASTM testing procedures. The laboratory shall maintain records of its quality control results and provide a manufacturer's certificate upon request to the Engineer prior to shipment. The certificate shall include:
1. Name of manufacturer
2. Chemical composition
3. Product description
4. Statement of compliance to specification requirements
5. Signature of legally authorized official attesting to the information required

2.03 PRICE AND PAYMENT PROCEDURES

A. REFER TO SECTION 01130 MEASURMENT AND BAIS OF PAYMENT.

2.04 SUBMITTALS

A. Record Data
B. Samples
C. Manufacturer

2.05 STANDARDS [NOT USED]
2.06 DELIVERY AND STORAGE [NOT USED]
2.07 JOB CONDITIONS [NOT USED]
2.08 OPTIONS [NOT USED]
2.09 GUARANTEES [NOT USED]

PART 2. PRODUCTS

3.01 2.01 MATERIALS
GEOTEXTILE: NON-WOVEN FABRIC CONSISTING OF U.V. STABILIZED POLYPROPYLENE FABRICS, FORMED INTO A STABLE NETWORK BY NEEDLE PUNCHING.

3.02 MIXES [NOT USED]
3.03 FABRICATIONS [NOT USED]
3.04 MANUFACTURED PRODUCTS [NOT USED]

PART 3. EXECUTION
NOT USED

PART 4. INSTALLATION

4.01 PREPARATION [NOT USED]

4.02 INSTALLATION

A. As indicated in the plans and as recommended by the Manufacturer.

B. Fabric shall be properly installed and wrapped around different medias with sufficient overlap and containment of material at filtration basins. **Coordinate meeting with ENGINEER prior to installation of geotextile fabric in filtration basins.**

C. Exposure of geotextiles to the elements between laydown and cover shall be a maximum of 14 days to minimize potential damage. Install the geotextile fabric in accordance with the plans and manufacturers recommendations. Construction vehicles will not be allowed to traffic directly on the fabric. In trenches, after placing the backfill material, fold the geotextile over the top of the filter material to produce a minimum overlap of 16" for trenches greater than 16" wide. In trenches less than 12" in width, the overlap shall be equal to the width of the trench. Cover geotextile with the subsequent course of backfill. Overlap successive sheets of geotextile a minimum of 12" in the direction of flow.

D. Where seams are required in the longitudinal trench direction, join them by either sewing or overlapping. Longitudinal overlaps shall be a minimum of 18”. Seams shall be subject to the approval of the Engineer.

E. Repair damaged geotextile with a geotextile patch, placed over the damaged area and extend 3' beyond the perimeter of the tear or damage.

4.03 FIELD QUALITY CONTROL [NOT USED]
4.04 CLEAN AND ADJUST [NOT USED]
4.05 SCHEDULES [NOT USED]

END OF SECTION

SECTION 33 0513
STORM SEWER APPURTENANCES

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION OF WORK:

A. This work shall consist of furnishing and installing appurtenances except manholes, for storm sewers in accordance with details on the plans and as specified herein as directed by the ENGINEER.

B. The various types of structures and appurtenances as inlets, headwalls, energy dissipaters, etc. are designated on the plans by letters or by numbers indicating the particular design of each. Each type shall be constructed in accordance with the details indicated and to the depth required by the profiled and scheduled given.

PART 2 - PRODUCTS

2.01 GENERAL

A. The construction plans will specify the size and material for the pipe between the storm sewer main and the storm water collection structure.

B. The various types of storm inlets and their relation to curb and gutter, or valley gutter are shown on the Standard Detail Drawings. Construction plans will identify the type to be constructed.

C. Grating size, material, and configuration shall conform to the Standard Detail Drawings.

2.02 MATERIALS

A. Concrete

1. Concrete for cast in place miscellaneous structures shall be Class A concrete when used with precast sewer construction and Class C concrete when used with monolithic pipe sewer construction.
2. Concrete for precast structures shall be 4000 psi and comply with the applicable requirements of ASTM 478.

B. Mortar:

1. Mortar shall be composed of 1 part Portland Cement and 2 parts clean, sharp mortar and sand suitably graded for the purpose by conforming in other respects to the provisions of Section 03300 for fine aggregate.
2. Hydrated lime or lime putty may be added to the mix, but in no case shall it exceed 10 percent by weight of total dry mix.

C. Reinforcement:

1. Reinforcing Steel shall conform to Section 03330.

D. Frames, Grates, Rings and Covers:

E. Miscellaneous Items:

1. Cast iron for supports, steps and inlet units shall conform to the shape and dimensions indicated. The casting shall be clean and perfect, free from sand or blow holes or other defects. Cast iron shall meet the requirements of ASTM A 48, Class 30. Steel for temporary covers when used with Stage Construction shall be adequate for the loads imposed.

PART 3 - EXECUTION

3.01 INSTALLATION OF DRAINAGE FACILITIES:

A. Excavation and backfilling for the storm inlet shall be accompanied in accordance with Section 31 2316.10.

B. Trenching, backfilling, and compaction for the connection pipe between the storm sewer main and the storm inlet shall conform to the specifications contained in Section 31 2316.15.

C. All pipe and structures shall be installed per location and elevation, as shown on the construction plans. If during the course of installation, an underground obstruction (i.e., existing utility line) the work shall stop and the ENGINEER shall be immediately notified so that the problem can be resolved.

D. Removal of curb and gutter, and sidewalk for installation of a storm inlet shall be made at a scored or full depth joint.

E. Existing pavement removal and replacement shall conform to details indicated on the plans.

F. No width greater than ½ inch will be permitted between the inlet grate and the roadside portion of the inlet frame.

G. The construction of inlets shall be done as soon as is practicable after sewer lines into the inlet are complete. All sewers shall be cut nearly at the inside face of the walls of the inlet and pointed up with mortar.
H. The inverts passing out or through an inlet shall be shaped and grout across the floor of the inlet as indicated. This shaping may be accomplished by adding shaping mortar or concrete after the base in cast or by placing the required additional material with the base.
I. All miscellaneous structures shall be completed in accordance with the details indicated. Backfilling to original ground elevation shall be in accordance with the provisions of the appropriate items and as directed by the ENGINEER.
J. PART 4 - MEASUREMENT AND PAYMENT

3.02 MEASUREMENT

A. Pavement removal and replacement will be measured by the square yard.
B. Trenching, backfilling and compaction will not be measured or paid, but will be considered incidental to other items.
C. Frame, grates, rings and covers will not be measured or paid, but will be considered incidental to other items.
D. Connecting pipe shall be measured by the linear foot along centerline of pipe from the main side wall of the inlet to the centerline of the main.
E. Storm sewer inlets shall be measured per each for the type and size specified.
F. All miscellaneous structures satisfactorily completed in accordance with the plan and specifications will be measured as complete units per each.

END OF SECTION

SECTION 33 0514
FIBERGLASS MANHOLES AND WETWELLS

GENERAL

1.01 WORK INCLUDED

A. Furnish all materials, labor and equipment and install fiberglass reinforced polyester manholes and wetwells complete and in place as shown on the Drawings and as specified herein.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Excavation and backfill is specified in Section 31 2316.10.
B. Gravel bedding is specified in Plan Sheet Detail.
C. Cast-in-place concrete is specified in Division 3.
D. Manhole frames and covers are specified in Division 3.

1.03 STANDARDS

A. ASTM D-3753: Standard Specification for Glass-Fiber Reinforced Polyester Manholes and Wetwells.
B. ASTM C-581: Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service.
C. ASTM D-2412: Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading.
D. ASTM D-695: Test Methods for Compressive Properties of Rigid Plastics.
E. ASTM D-2584: Test Method for Ignition Loss of Cured Reinforced Resins.
F. ASTM D-790: Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and electrical Insulating Materials.
G. ASTM D-2583: Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor.
H. AASHTO H-20: Axial Loading.

1.04 QUALITY ASSURANCE

A. Experience Requirements: Manholes and wetwells shall be the product of one (1) manufacturer having at least 5 years successful experience manufacturing fiberglass manholes and wetwells of the types and sizes as specified herein.
B. Inspection:
    1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the owner. Such inspections shall be made at the place of manufacture, or at site of delivery, and the sections shall be subject to rejection on account of failure to meet any of the specification requirements as specified herein. Sections rejected after delivery to the job site shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed shall be acceptable if repaired or removed and replaced at the contractor's expense.
    2. At the time of inspection, the material will be examined for compliance with the requirements of this specification and the approved drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
    3. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval.
C. Markings: All manholes and wetwells shall be marked on the inside. These markings shall be permanent and include:
    1. Manufacturer Identification (Name)
    2. Manufacturing Serial Number
    3. ASTM Designation
    4. Diameter and Length
D. Certification: The manufacturer of the fiberglass wetwells and manholes shall certify that all physical and chemical requirements listed in this specification are met. The certification shall be submitted to the engineer in writing and shall consist of a copy of the manufacturer's test report, accompanied by a copy of the test results, that the manhole has been sampled, tested, and inspected in accordance with

the provisions of ASTM 3753 and this specification, and meets all requirements. An authorized agent of the manufacturer shall sign each certification.

E. Acceptable Manufacturers:
   1. Containment Solutions, Inc., Conroe, TX.
   2. L.F. Manufacturing, Inc., Giddings, TX.
   3. Or equivalent.

1.05 SUBMITTALS

A. Manufacturer's descriptive literature and recommended methods of installation.
B. Certificates: Manufacturer's certification in accordance with 1.04.D.
C. Warranties

1.06 GUARANTEE/WARRANTY

A. In addition to the one (1) year warranty provided by the Contractor, wetwells and manholes shall be warranted by the manufacturer for a period of twenty (20) years against internal or internal corrosion and against structural failure.
B. Contractor shall obtain any training from the manufacturer as required for conditions of the warranty to be met.
C. If any wetwell or manhole fails within the warranty period, the manufacturer shall either repair it, deliver a replacement unit to the point of original delivery, or refund the original purchase price.

1.07 DELIVERY, STORAGE AND HANDLING

A. FRP wetwells and manholes shall be lifted by the installation of lifting lugs as specified by the manufacturer on the outside surface near the top of the wetwell. Wetwells and manholes may also be lifted in the horizontal position with two slings on a spreader bar. Use of chains or cables in contact with the wetwell/manhole surface is prohibited.
B. FRP wetwells and manholes may be stored upright or horizontally, however, the wetwell vertical deflection shall not exceed 4% of the diameter. The wetwell shall not be dropped or impacted.
C. Additional handling and installation instructions shall be in accordance with the FRP manufacturer's instructions.
D. Each FRP section manufactured in accordance with the drawings shall be clearly marked to indicate the intended installation location. The contractor shall be responsible for the installation of the correct FRP sections in their designated locations.

1.08 PRODUCTS

1.09 GENERAL REQUIREMENTS

A. Fiberglass reinforced polyester wetwells and manholes shall be manufactured from commercial grade polyester resin having fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection systems. Wetwells and manholes shall be a one-piece unit.

1.10 MATERIALS

A. Resin: The resins used shall be a commercial grade unsaturated polyester resin. UV inhibitors shall be added directly to resins to prevent photo-degradation during storage.
B. Reinforcing Materials: The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
C. Surfacing Materials: If reinforcing material is used on the surface exposed to wastewater and sewer gases, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.
D. Fillers and Additives: Fillers, when used, shall be inert to the environment and wetwell construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

1.11 FABRICATION

A. Exterior Surface: The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

B. Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of grazing, delamination, and blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted up to 6 square feet if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

C. Cylinder Section: Cylinders shall meet all requirements for pipe stiffness as required in ASTM D3753. All wetwells and manholes 6-foot diameter and larger shall be rib reinforced.

D. Fiberglass Reinforced Top/Cone: The fiberglass wetwell top or manhole cone shall be fabricated using fiberglass material as specified in Paragraph 2.02 and shall meet all requirements in 2.04 of this Section. Tops and cones to be attached to the cylinder at the factory with fiberglass layup in compliance with ASTM-D3299.
   1. Wetwell Tops and Hatch Openings:
      a. Wetwells shall be provided with glass reinforced tops as shown on the Drawings and shall be joined to the cylinder section at the factory with resin and glass fiber reinforcement forming a monolithic structure to prevent infiltration and exfiltration.
      b. Wetwell top shall be designed to withstand backfill and concrete slab. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to top per ASTM-D3299. Stiffeners shall be of non-corrosive materials encapsulated in fiberglass. FRP encapsulated wood or lumber is not permitted.
      c. Hatch opening dimensions and position to be as shown on the drawings and specified in Section 11322.
      d. Vapor barrier lip around hatch opening shall be constructed of fiberglass pultruded structural shapes. Vapor barrier lip shall extend to the hatch frame as shown on the Drawings so that no concrete of the top slab is exposed to the wetwell interior. Contractor to coordinate this dimensional requirement.
   2. Manhole Cones:
      a. The manway cone on manholes must provide a bearing surface on which a standard frame and cover may be supported and adjusted to grade.
      b. The cone shall be concentric and shall be joined to the cylinder section at the factory with resin and glass fiber reinforcement forming a monolithic structure to prevent infiltration and exfiltration.
      c. Manway cone shall have a raised collar around the manway opening over which HDPE manhole adjustment rings may be installed.

E. Bottom Flange: All wetwells shall have an integral bottom flange of minimum 3-inch width as shown on the drawings for embedment and anchoring of the cylinder in the concrete base slab. Where indicated on the drawings, manholes shall also have bottom flange.

F. Stubouts and Connections:
   1. Pipe connections 4” through 15” in diameter shall be made by means of “Inserta Tee” watertight compression connection. Connections may be factory installed.
   2. Pipe connections larger than 15” in diameter shall be factory installed and be of the following types:
      a. Rubber gasketed PVC sewer pipe stubouts installed with resin and glass fiber reinforced lay-up. Gaskets shall meet the same performance requirements of the sewer pipe to be installed.
      b. PVC or FRP pipe stubouts with resilient pipe-to-wetwell connectors (boots) conforming to the requirements of ASTM C-923.

G. Defects not Permitted:
   1. Exposed fibers: glass fibers not wet out with resin.
   2. Resin runs: runs of resin and sand on the surface.
   3. Dry areas: areas with glass not wet out with resin.
   4. Delamination: separation in the laminate.
   5. Blisters: light colored areas larger than 1/2 inch in diameter.
   6. Crazing: cracks caused by sharp objects.
   7. Pits or Voids: air pockets.
   8. Wrinkles: smooth irregularities in the surface.
   9. Sharp projection: fiber or resin projections necessitating gloves for handling.

1.12 DESIGN REQUIREMENTS

A. Wetwells and manholes shall be designed by the manufacturer to perform as underground structures at the depths required.

B. Complete manhole FRP structures shall be capable of supporting the top slab covers, frames, and soil overburdens plus a live load equivalent to AASHTO HS-20 loading. To establish this rating, the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

C. Cylinders shall be resistant to buckling when empty and when the groundwater elevation is at grade.

D. The anchoring wall structure at the embankment within the reinforced concrete base zone shall be designed to resist external hydrostatic water forces of an empty or full cylinder with the groundwater at grade elevation.

E. All cutouts for pipe connections specified and shown on the Drawings shall be capable of maintaining the unit's structural integrity.

F. Stiffness: The cylinder shall be tested in accordance with ASTM Method D 2412. The wetwell cylinder shall have the minimum pipe-stiffness values shown in the following table when tested in accordance with ASTM 3753, Section 8.5, (note 1).

1. STIFFNESS REQUIREMENTS
2. Length (ft) F/AY (psi)
3. 3 to 6 0.72
4. 7 to 12 1.26
5. 10 to 20 2.01
6. 21 to 30 3.02
7. 31 to 40 5.24

G. Physical Properties:

	Hoop Direction	Axial Direction	
1. Tensile Strength (psi)	18,000	5,000	
2. Tensile Modulus (psi)	0.8 x 106	0.7 x 106	
3. Flexural Strength (psi)	22,500	14,300	
4. Flexural Modulus (psi)			
a. (no ribs - 48", 60", 72")		1.4 x 106	0.7 x 106
b. (with ribs - 72", 96", 144")		0.7 x 106	0.7 x 106

H. Dimensional Requirements:

1. The wetwells and manholes shall be a circular cylinder, sized per the plans for the applicable locations. Wetwells shall be produced per the length indicated on the plans +/- ½". Manholes shall be produced in half-foot increments of length +/- 2 inches. Tolerance on the inside diameter shall be +/- 1%. Other diameters as agreed upon between purchaser and the manufacturer are covered by this specification.
2. The minimum wall thickness for all wetwells and manholes at any depth shall be 0.50 inches measured to the nearest percent (0.01 inches) with micrometer, caliper, gauge or other suitable instrument. A minimum of one thickness reading per 33.4 ft2 of laminated surface in area of constant thickness shall be made. Through regions of wall taper, sufficient checks must be made to establish actual thickness. The test shall be run at least once per ten manholes.

1.13 EXECUTION

1.14 EXCAVATION

A. The Contractor shall do all necessary excavation for the various wetwells and manholes. Such excavations shall be of sufficient size to permit the proper installation of the base and wall forms and allow room for the striping of forms. All excavation shall conform to the size and dimensions as shown on the drawings plus a maximum of four feet to permit working room.

B. Care shall be taken to insure that the excavation is not carried to a greater depth than required. If shoring the wall of the excavated area becomes necessary, shoring shall be of two-inch material. Shoring shall be braced to insure support of the walls and also permit the construction of the wetwell or manhole itself without necessitating the removal of any shoring until such time as the entire manhole is

completed. No shoring shall be left or backfilled around, unless authorized by the engineer. Shoring shall remain in place for at least twenty-four hours after the concrete work has been completed.

C. Contractor shall be responsible for handling groundwater to provide firm, dry subgrade for the structure, shall prevent water from rising on new poured-in-place concrete within 24 hours after placing, and shall guard against flotation or other damages resulting from groundwater or flooding. The Contractor shall be fully responsible and liable for all damages resulting from failure of the dewatering plan or system. Refer to Section 01563 GROUNDWATER HANDLING.

1.15 GENERAL CONSTRUCTION METHODS

A. All wetwell and manhole work shall be completed and finished in a careful and workmanlike manner, special care being given to cutting and installing wall penetrations in the wall of the cylinder.

B. Field-installed connections for sewer pipe 4" through 15" in diameter shall be made by means of watertight compression connection (e.g. "Inserta Tee", or approved equal) as shown on the plans and details. Cutouts and installation shall be in strict accordance with manufacturer's written instructions utilizing installation equipment (e.g. hole saw) approved for use by the manufacturer of the fitting. Use of equipment which does not meet this requirement is expressly prohibited. Jig saws, saber saws, or axes, hammers, chisels, and similar impact type tools shall not be used.

C. Field fabrication of stubouts using FRP lay-up reinforcement is prohibited unless approved in writing by the Engineer.

D. All connections shall be made on flat surfaces of cylinder or top away from structural ribs. Contractor shall coordinate location and elevations of all connections with the manufacturer before fabrication to ensure this requirement is met.

E. All cut edges where glass fiber is exposed (e.g. hole saw cuts in the cylinder section or top) shall be coated with resin to prevent wicking of moisture into fiberglass laminate. Contractor shall use resin of the same type and grade as used in the fabrication of the wetwell/manhole.

F. The bottom of manholes shall be completed by installing sufficient additional concrete/grout to shape or form the bench as shown on the drawings.

G. The cast-in-place concrete base slab shall be placed on a 6-inch minimum bed of gravel. Sub-base soil below gravel bed shall be thoroughly compacted to minimum 95% Standard Proctor Density.

H. The bottom of the fiberglass manhole or wetwell shall be cast-in-place a minimum of 4 inches and shall be adjusted in grade so that the top slab section is at the elevation specified in the drawings. Contractor shall be responsible for coordinating and verifying all dimensional requirements as specified and shown on the Drawings.

I. Contractor shall internally brace fiberglass wetwell tops during placement of top slab concrete to support and prevent deflection of the top while the slab cures.

1.16 BACKFILLING

A. Anti-flotation rings made from lean concrete mix shall be poured in place around manhole and wetwell in quantities as shown on the Drawings. Anti-flotation rings shall be poured only after the concrete base slab has been allowed to cure the required time and the forms and shoring have been removed.

B. The backfilling around the outside of manholes shall commence as soon as the anti-flotation ring has cured. Backfill shall be placed in layers of not more than 12 inches and shall be thoroughly tamped before the next layer is installed.

C. Backfill shall be either hand or mechanically tamped. Whichever method is used, care must be exercised to insure that the backfill is thoroughly compacted to 90% Standard Proctor Density (ASTM D-690).

D. Unless shown otherwise on the drawings, suitable material selected from the excavation shall be used for backfill. Material shall be subject to approval by the Engineer.

1.17 DROP MANHOLES

A. Drop manholes shall consist of a standard sanitary sewer manhole with one standard drop connection on one side only, as shown in the detail drawings. All materials used in the drop connection shall conform to the requirements of the pertinent specification.

1.18 CASTINGS AND CLEANING

A. Manhole frames and covers within the limits of bituminous concrete pavement shall be set at the elevation of the top of the wearing course.

B. All new manholes and wetwells shall be thoroughly cleaned by the removal of all accumulations of silt, debris and foreign matter of any kind, prior to final inspection.

1.19 MANHOLE TESTING

A. Refer to Section 02570 for manhole testing requirements.

1.20 WETWELL TESTING

A. Successful passage of a hydrostatic test shall be required for acceptance of all wetwells. Testing shall be conducted with all connections in place. If a wetwell fails a hydrostatic leakage test, it shall be made watertight and retested.

B. Test Procedure:

1. Pneumatic test plugs with a sealing length equal to or greater than the diameter of the connecting pipe to be sealed shall be used to plug all influent, effluent, and vent pipes.
2. Wetwell shall be filled with water (provided by the Contractor and as approved by the Engineer) to a pre-determined level at or immediately below the underside of the fiberglass top. Additional water may be added over a twenty-four (24) hour period to compensate for absorption and evaporation losses.
3. At the conclusion of the twenty-four (24) hour saturation period, the wetwell shall be filled to the original level and the water level observed by reference to gradations marked on a measuring rod or a pump guide rail.
4. The wetwell shall be considered to pass the hydrostatic test if the rate of leakage or water loss is equal to or less than 0.025 gallons per foot diameter per foot of wetwell depth per hour.

C. Testing and Certification:

1. Testing shall be done by the Contractor and witnessed by the Engineer or his representative. All wetwells shall be tested as finished and completed for final acceptance.
2. Any defective work or materials shall be corrected or replaced by the contractor and retested. This shall be repeated until all work and materials are acceptable.

END OF SECTION

SECTION 33 1116
WATER TRANSMISSION LINES AND/OR PRESSURE SEWER LINES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. Trenching, Backfilling and Compacting: Section 31 2316.13.
B. SUBMITTALS:
C. Manufacturer's Literature: Manufacturer's descriptive literature and recommended method of installation.
D. Certificates: Manufacturer's certification that products meet specification requirements.
E. PRODUCT DELIVERY, STORAGE, AND HANDLING:
F. Deliver materials on manufacturer's original skids or in original unopened protective packaging. OWNER reserves the right to reject material left from another job.
G. Store materials to prevent physical damage.
H. Protect materials during transportation and installation to avoid physical damage.
I. GENERAL DESCRIPTION OF WORK COVERED:
J. Furnish and install all pipe, fittings, structures and accessories required for water transmission line and/or pressure sewer lines.
K. QUALITY ASSURANCE:
L. Comply with the latest published edition of American Water Works Association (AWWA) Standards:
   1. AWWA C110 & C11Oa - Gray Iron and Ductile-Iron Fittings, 2 inch through 48 inch for water and other liquids.
   2. AWWA CIll - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings.
   3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
   4. AWWA C151 - Ductile-Iron Pipe, centrifugally cast in metal mold or sand lined molds, for water or other liquids.
   5. AWWA C153 - Ductile-Iron Compact fittings, 3 inch through 12 inch for water and other liquids.
   6. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe 4 inch through 12 inch for water.
   7. AWWA C301-79 - Prestressed Concrete Pressure Pipe - Steel Cylinder Type, for water and other liquids.
M. Comply with the latest published editions of the American Society for Testing and Materials (ASTM) Standards:
   1. D 2241 - Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
   2. D 3139 - Joints for PVC Pressure Pipes using Flexible Elastomeric Seals.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS:

A. Pipe furnished may be either PVC or steel cylinder as specified herein for water mains unless shown otherwise on the plans or bid documents.
B. Use PVC pipe for all pressure sewer lines unless shown otherwise on the plans.
C. All pipe shall be marked in accordance with the applicable standard specification under which the pipe is manufactured unless otherwise specified.
D. Steel cylinder pipe manufactured shall have had a successful experience record in the design and manufacture of steel cylinder pipe with substantial footage in successful operation for at least five years.
E. POLYVINYL CHLORIDE PIPE (PVC):
F. Provide pipe meeting AWWA C900 PVC 1120 or ASTM D2241 Type 1 Grade 1 PVC 1120 Standards.
   1. Minimum requirements:

	a. Pressure	Pressure		
2.	Size	DR	Class(psi)	Rating(psi)
3.	4"-12"	18	150	150
4.	2"- 4"	26	95	160
5.	6"-12"	21	120	200

   6. Use pipe meeting minimum requirements unless shown otherwise on plans.
G. Provide push-on joints with bell integrally cast into pipe or with coupling of same material as pipe.

H. Use elastomeric gaskets, as provided in AWWA C900 or ASTM D3139.
I. Provide either cast-iron or PVC 1120 fittings as indicated or required. Use long radius fittings where possible.
J. Provide fittings with materials and pressure class equal to or greater than that specified for pipe.
K. Provide sleeve type or anchored coupling where indicated or required to join pipe or provide restraint to offset internal or hydrostatic test pressures.
L. Provide pipe marked to indicate the following:
    1. Nominal Pipe Size.
    2. Material Code Designation.
    3. Standard Dimension Ratio.
    4. Pressure Rating.
    5. Manufacturer's name or trademark.
    6. National Sanitation Foundation Seal.
    7. Appropriate ASTM designation number.
    8. STEEL CYLINDER PIPE (SCP):
M. Provide pipe meeting AWWA C301-79.
N. All pipe and fittings shall have the approval of the Underwriter's Laboratories, Inc.
O. Provide pipe with minimum pressure class of 150 psi or as shown on plans or in Special Conditions.
P. Provide fittings with materials and pressure class equal to or greater than that specified for pipe.
Q. Joint wrappers:
    1. Shall be of quality manufactured by Mar-Mac-Manufacturing Company or approved equal.
    2. Shall be hemmed at each edge to allow threading with a steel strap to securely fasten the wrapper around the pipe by means of a stretcher and sealer.
    3. Minimum width of 7 inches for pipe with diameter of 33 inches or smaller; 9 inches for pipe with diameter greater than 33 inches.
    4. Length sufficient to circle pipe.
R. Cement Mortar:
    1. Mortar used at joint shall consist of 1 part portland cement to 2 1/2 parts fine, sharp clean sand mixed with water.
    2. Interior joint mortar shall be mixed with as little water as possible to produce a very stiff but workable mixture.
    3. Exterior joint mortar shall be mixed with water to a consistency of thick cream.
S. Provide pipe marked to indicate the following:
    1. Pressure for which the pipe or fitting is designed.
    2. Identification marks to show proper location.
    3. All beveled pipe shall be marked with the amount of the bevel.
    4. Manufacturer's name.
    5. Material code designation.
    6. National Sanitation Foundation Seal.
    7. DUCTILE IRON PIPE FITTINGS (DIP):
T. Shall be in accordance with AWWA C-llO with pressure rating of not less than that specified for adjacent pipe.
U. Shall be compatible with joint type of adjacent pipe.
V. All specials, taps, plugs, flanges and wall fittings shall be as required.
W. Shall have cement mortar lining in accordance with AWWA C104.
X. Shall be coated with manufacturer's standard coating.
Y. VALVES, HYDRANTS AND METERS:
Z. Gate Valves:
    1. Design: AWWA C-509, CRS-80 by American Darling, Metroseal by U.S. Pipe, Mueller, or equal.
    2. Type: Compression Resilient Seated.
    3. Material: Cast iron body with epoxy coated interior.
    4. Rating: 200 psi working pressure class.
    5. Stem: Double "O" ring stem seal.
    6. Operators: Open counterclockwise with 2 inch square operating nut.

7. Flange: x push-on valves must be used on all fire hydrants installed on water main 10 inches or larger.

AA. Valve Boxes:
1. Provide for all buried valves.
2. Use nominal 6 inch cast-iron sliding type pipe shaft with cover and base casting.
3. Set box top at finished grade.
4. Furnish drop cover appropriately marked "WATER".

AB. Corporation Stops:
1. Conform with AWWA C-800.
2. Use 3/4 inch unless indicated otherwise.

AC. Hydrants:
1. Design: latest edition of AWWA C502, traffic model with break flange.
2. Mueller Centrurion - A423
   a. American-Darling - B-84-B
   b. Kennedy Guardian - K-81A
   c. U.S. Pipe - Metropolitan
   d. Others as approved by OWNER in writing
3. Provide 6 inch inlet, 2 - 2> inch hose nozzles, 1 - 4> inch pumper.
4. Provide compression type main valve, minimum size 5< inches.
5. Pentagon operating nut.
6. Design to open counterclockwise.
7. Provide mechanical joint bell on footpiece.
8. Furnish depth as noted on plans.
9. Furnish National (American) Standard Fire Hose Coupling Screw Thread (NH).

AD. Polyethylene Wrapping:
1. Material: AWWA C105.
2. Thickness: 8 mils.

AE. Polyethylene Plastic Pipe (PE):
1. Material: ASTM D2737.
2. Fittings: ASTM D2683.
3. Size: 3/4 inch unless shown otherwise on plans.

AF. Copper Pipe (CU):
1. Material: seamless, Type K, ATM B88.
2. Fittings: wrought copper solder joint or flared.
3. Size: 3/4 inch unless shown otherwise on plans.

PART 3 - EXECUTION

3.01 GENERAL:

A. Provide all labor, equipment and materials and install all pipe fittings, special and appurtenances as indicated or specified.

B. PIPE INSTALLATION:

C. Handling:
1. Handle in a manner to insure installation in sound and undamaged condition.
   a. Do not drop or bump.
   b. Use slings, lifting lugs, hooks and other devices designed to protect pipe, joint elements, and coatings.
2. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.
3. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

D. Installation:
1. Utilize equipment, methods, and materials insuring installation to lines and grades as indicated.
   a. Do not lay on blocks unless pipe is to receive total concrete encasement.

E. Accomplish horizontal and vertical curve alignments of ductile iron pipe with bends, bevels or deflection joints.
1. Limit joint deflection with ductile iron pipe to conform with AWWA C600.

2. Use short specials preceding curves as required.
3. Obtain approval of ENGINEER of method proposed or transfer of line and grade from control to the work.
4. Install pipe of size, material, strength class, and joint type with embedment as shown on plans or specified herein.
5. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation.
    a. Close open ends of pipe with snug fitting closures.
    b. Do not let water fill trench. Include provisions to pre-vent flotation should water control measures prove inadequate.
    c. Remove water, sand, mud and usher undesirable materials from trench before removal of end cap.
6. Pipe shall be inspected prior to installation to determine if any pipe defects are present.
7. Brace or anchor as required to prevent displacement after establishing final position.
8. Perform only when weather and trench conditions are suitable.
    a. Do not lay in water.
9. Observe extra precaution when hazardous atmospheres might be encountered.
10. Sanitary sewer relation to water mains:
    a. Maintain 9 feet horizontal separation whenever possible.
    b. When conditions prevent a lateral separation of 9 feet, sewer may be installed closer to a water main if:
        1) sewer constructed of PVC pipe meeting AWWA Specifications and having a minimum working pressure rating of 150 psi or greater and equipped with pressure type joints, and
        2) the sewer line and water main are separated by a minimum vertical distance of 2 feet and a minimum horizontal distance of 4 feet, measured between the nearest outside diameters of the pipes.
    c. When a sanitary sewer crosses a water line and that portion of the sewer is constructed as described is 3.02 B.9.b.(1), the sewer may be placed no closer than 6 inches from the water line. The separation distance must be measured between the nearest outside pipe diameters. The sewer line shall be located at a lower elevation than the water line whenever possible and one length of the sewer pipe must be centered on the water line.
11. Separation of water mains from sewer manholes:
    a. No water pipe shall pass through or come in contract with any part of a sewer manhole.
    b. A minimum horizontal separation of 9 feet shall be maintained.
12. Construct service lines where shown on plans in accordance with Standard Detail Drawing D-48 or D-49. Use pipe material specified on plans or in contract documents.
13. Wrap pipe, fittings and tie rods with polyethylene where shown on plans in accordance with AWWA C105.

F. Jointing:
1. General requirements:
    a. Locate joint to provide for differential movement at changes in type of pipe embedment, at changes from rock to soil trench bottom, and structures.
        1) Not more than 18 inches from structure wall, or
        2) Support pipe from wall to first joint with concrete cradle structurally continuous with base slab or footing of structure.
        3) Perform in accordance with manufacturer's recommendations.
        4) Clean and lubricate all joint and gasket surfaces with lubricant recommended.
        5) Utilize methods and equipment capable of fully homing or making up joints without damage.
        6) Check joint opening and deflection for specification limits.
2. Special provisions for jointing cast-iron and ductile iron:
    a. Conform to AWWA C600.
    b. Visually examine while suspended and before lowering into trench.

1) Paint bell, spigot, or other suspected portions with turpentine and dust with cement to check for cracks invisible to the eye.
2) Remove turpentine and cement by washing when test is satisfactorily completed.
3) Reject all defective pipe.

3. Special provisions for jointing and laying PVC pipe:
   a. Conform to AWWA C600 and ASTM D2321.
   b. Allow pipe to reach trench soil temperature prior to installation in ditch.
4. Special provisions for jointing steel cylinder pipe:
   a. Before laying each joint, the bell and spigot rings shall be cleaned by wire brush and wiped clean and dry.
   b. Inside cement mortar joint:
      1) the inside joint recess shall be filled immediately prior to placing the pipe together by buttering the bell end with mortar.
      2) the joint mortar of pipe 18 inch diameter and smaller shall be smoothed and cleaned with a swab.
      3) the joint mortar of pipe diameters larger than 18 inches shall be finished off smooth by hand trowel.
      4) Outside cement mortar joint:
         (a) encircle joint with wrapper after joint found satisfactory.
         (b) leave enough space between wrapper ends to allow cement mortar to be poured.
         (c) the entire joint shall be poured with cement mortar and consolidated and rodded or agitated to eliminate voids.

G. Cutting:
   1. Cut in neat workmanlike manner without damage to pipe.
   2. Cut cast-iron with carborundum saw or other approved method.
      a. Smooth cut by power grinding to remove burrs and sharp edges.
      b. Repair lining as required and approved by ENGINEER.

H. Closure Pieces:
   1. Connect two segments of pipelines or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.
   2. Observe specifications regarding location of joints, type of joints and pipe materials and strength classifications.
   3. May be accomplished with sleeve coupling for water pipe:
      a. Of length such that gaskets are not less than 3 inches from pipe ends.
      b. Include spacer ring identical to pipe end such that clear space does not exceed 1/4 inch.

I. Temporary Plugs:
   1. Install whenever installed pipe is left unattended.
   2. Use water tight plug.

J. Thrust Blocks:
   1. Provide for all horizontal or vertical turns utilizing fittings.
   2. Use on all dead-end and tee fittings.
   3. Install as indicated on Standard Detail Drawing D-7
   4. Construct to undisturbed edge of trench for bearing.
   5. Provide minimum bearing area in S.F. as follows based on 150 psi test pressure and 2000 psf soil bearing:

Pipe Size	Plug, T's	11-1/4º Bend	22-1/2º Bend	45º Bend	90º Bend
4"	1.0	.5	.5	.8	1.3
6"	2.2	.5	.9	1.6	3.0
8"	3.8	.8	1.5	2.9	5.3
10"	6.0	1.12	2.3	4.5	8.4
12"	8.5	1.7	3.3	6.5	12.1
14"	11.6	2.3	4.5	8.9	16.4
16"	15.2	3.0	5.9	11.6	21.4

other	Submit Calculations	Submit Calculation	Submit Calculations	Submit Calculations	Submit Calculations

K. VALVE AND APPURTENANCE INSTALLATION:
   1. Valves:
      a. Install with stems vertical when installation is horizontal.
      b. Set valves on concrete thrust block having four (4) square feet of bearing area on undisturbed earth.

L. Valve Boxes:
   1. Center on valves.
   2. Carefully tamp earth around each valve box to a distance of 4 feet on all sides of box or to undisturbed trench face, if less than 4 feet.

M. Hydrants:
   1. Set hydrants where shown on plans in accordance with Standard Detail Drawing D-12.
   2. Install gravel, blocks and anchors in accordance with Standard Detail Drawing D-12.
   3. Set reference elevation 3 inches above existing grade or to elevation established by ENGINEER (not to exceed 6 inches).
   4. Break-a-way flange to be either ground level where applicable or between 3 inches and 6 inches above curb as established by ENGINEER.
   5. ACCEPTANCE TESTS FOR PRESSURE MAINS:

N. Perform hydrostatic pressure and leakage test.
   1. Conform to AWWA C600 procedures.
      a. As modified herein.
      b. Shall apply to all pipe materials specified.
      c. Perform after backfilling.

O. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.
   1. CONTRACTOR to furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs, at no additional cost to the OWNER.
   2. CONTRACTOR responsible for any damage to public or private property caused by failure of plugs.

P. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.

Q. OWNER will make water for testing available to contractor at nearest source. Valves of existing system will at all times be operated by City personnel only.

R. Pressure test:
   1. Conduct at pressure at least 1.5 times than normal working pressure (not less than 150 psi test pressure).
   2. Maintain pressure for a minimum of two (2) hours.
   3. Test pressure shall not vary by more than +5 psil'6 (-- 9C.1Y)

S. Leakage Test:
   1. Conduct concurrently with the pressure test.
   2. Maintain pressure for a minimum of two (2) hours.
   3. Acceptable when leakage does not exceed that determined by the following formula:
      a. L = ND P
      b. 7400
         1) L = Maximum permissible leakage in gallons per hour.
         2) N = Number of pipe joints in segment under test.
         3) D = Nominal internal diameter of pipe being tested in inches.
         4) P = Average actual leakage test pressure, psig.
   4. Repeat leakage test as necessary.
      a. After location of leaks and repair or replacement of defective joints, pipe or fittings.
      b. Until satisfactory performance of test. c. At no increase in cost to the OWNER.

T. Refit and replace all pipe not meeting the leakage or pressure requirements. Repair clamp is not permitted.
U. Repair all visible leaks regardless of the amount of leakage.
V. OWNER or ENGINEER will observe all tests.
W. DISINFECTION OF PIPELINES FOR CONVEYING POTABLE WATER:
X. CONTRACTOR provide all equipment and materials and perform in accordance with AWWA C601.
    1. As modified herein.
    2. Include chlorination and final flushing.
Y. Add chlorine to attain an initial concentration of 50 mg/l chlorine with 10 mg/l remaining after 24 hours.
Z. Flush main until concentration is 2 mg/l or less prior to placing main in service.
AA. Obtain approval of materials and methods proposed for use.
AB. May be conducted in conjunction with acceptance tests.
AC. Dispose of flushing water without damage to public or private property.
AD. Repeat disinfection procedure should initial treatment fail to yield satisfactory results.
    1. At no additional cost to the OWNER.
    2. OWNER will provide water under terms specified for acceptance tests.
AE. Do not exceed 500 gpm rate in flushing.
AF. Provide safe bacterial sample results before placing main into service.
AG. PART 4 - MEASUREMENT AND PAYMENT
AH. PRESSURE LINES:
AI. Line shall be measured along the center of the pipe without considering fittings or other pipe connections. The line will be paid at the contract bid price per linear feet.
AJ. Compensation will be for furnishing all materials, labor, equipment, tools and incidental work required by the construction of the pressure line, all in accordance with the plans and these specifications.
AK. If pressure line fails any test procedure, trouble spot is to be corrected all as incidental to the construction of the pressure line.

END OF SECTION

SECTION 33 1300
DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1416.

1.02 RELATED REQUIREMENTS

A. Section 33 1416 - Site Water Utility Distribution Piping.

1.03 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites; 2011.
B. AWWA B301 - Liquid Chlorine; 2010.
C. AWWA B302 - Ammonium Sulfate; 2010.
D. AWWA B303 - Sodium Chlorite; 2010.
E. AWWA C651 - Disinfecting Water Mains; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Test Reports: Indicate results comparative to specified requirements.
C. Certificate: From authority having jurisdiction indicating approval of water system.
D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.
E. Disinfection report:
F. Bacteriological report:
    1. Date issued, project name, and testing laboratory name, address, and telephone number.
    2. Time and date of water sample collection.
    3. Name of person collecting samples.
    4. Test locations.
    5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
    6. Coliform bacteria test results for each outlet tested.
    7. Certification that water conforms, or fails to conform, to bacterial standards of City of McAllen.

1.05 QUALITY ASSURANCE

A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of Texas.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system and water well has been cleaned, inspected, and pressure tested.
B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
B. Provide and attach equipment required to perform the work.
C. Inject treatment disinfectant into piping system.
D. Maintain disinfectant in system for 24 hours.
E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
F. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000.
B. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 33 3111
SITE SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.
B. Connection of building sanitary drainage system to municipal sewers.
C. Cleanout access.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
B. Section 31 2316 - Excavation: Excavating of trenches.
C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
D. Section 31 2323 - Fill: Bedding and backfilling.
E. Section 33 0513 - Manholes and Structures.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
B. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.
C. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories, and _____.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).
B. Plastic Pipe: ASTM D2241 SDR 21, Class 200 (PVC) material; inside nominal diameter of 6 inches, bell and spigot style solvent sealed joint end.
C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 CLEANOUT MANHOLE

A. Lid and Frame: Cast iron construction, hinged lid.
   1. Nominal Lid and Frame Size: 26 inches.

2.04 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Plan Detail Sheet.
B. Pipe Cover Material: As specified in Plan Detail Sheet.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Section 31 2316.13 for additional requirements.
B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.
C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
D. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.
E. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.04 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.
B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
C. Establish elevations and pipe inverts for inlets and outlets as indicated.
D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 4111
SITE STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.
B. Connection of drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
B. Section 31 2316 - Excavation: Excavating of trenches.
C. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
D. Section 31 2323 - Fill: Bedding and backfilling.
E. Section 33 0513 - Manholes and Structures.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. TxDOT Item 464, Reinforced Concrete Pipe , Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 edition.
B. TxDOT Item 465, Junction Boxes, Manholes, and Inlets, Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 edition.
C. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).
E. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.
F. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.
G. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
H. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
I. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories, and Fittings.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Product Data: Provide data indicating pipe, pipe accessories, and _____.
E. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
F. Field Quality Control Submittals: Document results of field quality control testing.
G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
H. Project Record Documents:
    1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
    2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).
B. Concrete Pipe Joint Devices: ASTM C443 (ASTM C443M) rubber compression gasket joint.
C. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class IIII and Class IV .A; mesh reinforcement; inside nominal diameter of see plan inches, bell and spigot end joints.
D. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

E. Corrugated Dual Wall Pipe: ASTM F2881, Polypropylene (PP) material; inside nominal diameter of 12 to 30 inches, reinforced bell with polymer composite band and dual gaskets.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.
C. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.

2.03 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. As shown on the plans

2.04 BEDDING AND COVER MATERIALS

A. Bedding material and cover for flexible pipe as specified by manufacturer of product.
B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 2316.13 for additional requirements.
B. Hand trim excavation for accurate placement of pipe to elevations indicated.
C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

A. RCP connections to inlet structures shall be watertight; opening in storm sewer structure shall be pre-manufacture or neatly saw cut to a diameter that is a 1/4 - 1/2 inch larger than the outer diameter of the RCP. Secured with a concrete collar and sealed with high strength mortar. Hammering or breaking of the structure will not be allowed, structures that are hammered and expose structural cracks will be replaced by the contractor at no additional cost to the owner.
B. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
C. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.
D. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
E. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
F. Make connections through walls through sleeved openings, where provided.
G. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.
B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.
C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
D. Establish elevations and pipe inverts for inlets and outlets as indicated.
E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.
F. Prefabricated trench drains:
   1. Excavate; prepare substrate and supports according to the manufacturer's printed installation instructions.
   2. Install prefabricated trench drain system according to the manufacturer's printed installation instructions.
   3. Expansion, Construction, and Control Joints: Do not locate trench drain system on an expansion, construction or control joint in concrete or pavement. Where concrete or pavement joints running

transverse to direction of flow cross the trench drain system, locate concrete or pavement joints and trench drain system joints so that both coincide.

4. Concrete Trench Support: 3000 pounds per square inch compressive strength, minimum.
   a. Provide support on all sides of trench in minimum thickness recommended by trench drain system manufacturer.
   b. Screed and finish top edge of concrete flush with top surface of trench drain system.
   c. Do not use secondary edge finishing tools.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01 4000 - Quality Requirements.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to OWNER.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

100□ CONSTRUCTION DOCUMENTS

JUNE 7, 2019

PSJA COLLEGE 3
READY.CONNECTED.COMPLETE™

Je□u□ "Je□□e" □□□ □r□n□	Pre□den□
J□r□e "Ge□r□e" P□□□□□□	V□e Pre□den□
J□r□e □□□ □r□n□	Se□re□r□Tre□□urer
R□□rd□ "R□□" Pedr□□□	A□□. Se□re□r□Tre□□urer
V□□□r Pere□	Me□ □er
Je□u□ "Je□□e" Ve□, Jr.	Me□ □er
C□r□□ G. V□e□□□, Jr.	Me□ □er
Dr. D□n□e□P. K□n□	Su□er□n□enden□

Pharr

Dr. A□ □r□□□ "A□ □□" Hern□nde□	M□□□r
E□e□□□r Gu□□rd□	C□□ □ □□□□ner
R□□er□ "B□□□□" C□rr□□	C□□ □ □□□□ner
R□□ r□ C□□□□er□	C□□ □ □□□□ner
D□n□e□C□□□e□	C□□ □ □□□□ner
R□□rd□ Med□n□	C□□ □ □□□□ner
I□□□ F□re□	C□□ □ □□□□ner
A□e□Me□de	C□□ M□n□□er

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
M□ALLEN, TX 78503
956 . 994.1900

ARCHITECTURAL ABBREVIATIONS

NOTE: NOT ALL ABBREVIATIONS ARE USED

℄	CENTERLINE
ACOUST	ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
ACP	ACOUSTICAL CEILING PANEL
ADA	AMERICANS WITH DISABILITIES ACT
AESS	ARCHITECTURALLY EXPOSED STRUCTURAL STEEL
AFF	ABOVE FINISH FLOOR
ALT	ALTERNAT(–E,–IVE)
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
APPROX	APPROXIMAT(–E,–LY)
ARCH	ARCHITECT (–URAL)
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AVG	AVERAGE
BLDG	BUILDING
BM	BENCH MARK
BOL	BOLLARD
BFF	BELOW FINISH FLOOR
CH	CEILING HEIGHT
CMU	CONCRETE MASONRY UNIT
CNTR	COUNTER
COL	COLUMN
COLS	COLUMNS
CONC	CONCRETE
COORD	COORDINATE
CPT	CARPET
CJ	CONTROL JOINT
CT	CERAMIC TILE
DEMO	DEMOLISH OR DEMOLITION
DET	DETAIL(–S)
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIM	DIMENSION(–S)
DL	DOCK LEVELER
D.L.P.	DOUBLE HEAD LIGHT POLE
DR	DOOR
DS	DOWN SPOUT
DWG(S)	DRAWING(–S)
(E)	EXISTING
EA	EACH
EEW	EMERGENCY EYE–WASH
EEWS	EMERGENCY EYE–WASH AND SHOWER
EF	EACH FACE OR EXHAUST FAN
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
ELEV	ELEVATION
ELEC	ELECTRIC(–AL)
EMERG	EMERGENCY
EOD	EDGE OF DOCK
EQ	EQUAL(–LY)
EQUIP	EQUIPMENT
EXT	EXTERIOR
EW	EACH WAY
EP	ELECTRICAL POWER & METER CAN
(F)	FIXTURE
FA	FIRE ALARM
FD	FLOOR DRAIN
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FACTORY FINISH, FINISH FLOOR
FH	FIRE HYDRANT
FLR	FLOOR
FRT	FIRE–RETARDANT TREATED
FTG	FOOTING
FURN	FURNITURE
GA	GAUGE
GDL	GROUND LEVEL
GYP	GYPSUM
HB	HOSE BIB
HC	(HANDICAP) ACCESSIBLE
HGT,HT	HEIGHT
HORIZ	HORIZONTAL
HVAC	HEATING, VENTILATION & AIR CONDITIONING
IN	INCH(–ES)
JB,J–BOX	JUNCTION BOX
JST	JOIST
JT	JOINT
LAV	LAVATORY
MAX	MAXIMUM
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MTL	METAL
MIN	MINIMUM
N	NORTH
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NOP	KNOCK–OUT PANEL
OC	ON CENTER
OTS	OPEN TO STRUCTURE
PERF	PERFORAT(–E, –ED, –ES, –ATION)
PL	PROPERTY LINE, PLATE
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PLYWD	PLYWOOD
PNL	PANEL
PROJ	PROJECT(–TION)
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
P.J.	PANEL JOINT
RAD	RADIUS
RE:	REFER, REFERENCE
REQ	REQUIRED
RL	RISER LINE (STAIRS)
RR	RESTROOM
SCH	SCHEDULE
SHT	SHEET
S.L.P.	SINGLE HEAD LIGHT POLE
SPECS	SPECIFICATIONS
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
STD	STANDARD
STOR	STORAGE
STRUCT	STRUCTURE
S/W	SIDEWALK
SYM	SYMMETRICAL
TEMP	TEMPORARY
T.C.	TRENCH COVER
VCT	VINYL COMPOSTION TILE
VERT	VERTICAL
W/	WITH
W/O	WITHOUT
XFMR	TRANSFORMER

SYMBOLS

ANNOTATION

BUILDING ELEVATION REFERENCE

BUILDING SECTION REFERENCE

WALL SECTION REFERENCE

DETAIL REFERENCE

PLAN NORTH

NORTH ARROW

A / B / C / D

INTERIOR ELEVATION REFERENCE

STRUCTURAL GRID

+0"

ELEVATION OF ARCHITECTURAL ELEMENT

ROOM

ROOM/SPACE IDENTIFIER
ROOM NAME
ROOM NUMBER

TITLE
SCALE

TITLE MARK
REFERENCE NUMBER

BREAK MARK

MATCH LINE SEE SHEET A-XXX

REFERENCE TO SHEET WHERE WORK THIS SIDE OF MATCHLINE IS DRAWN

PARTITION TYPE

WINDOW TYPE REFERENCE

DOOR TYPE REFERENCE

DOOR REFERENCE NUMBER

ACCESSORY KEY

EQUIPMENT KEY

REVISION NUMBER

CEILING HEIGHT MARKER

ELECTRICAL

2'x4' RECESSED FLUORESCENT FIXTURE

2'x4' RECESSED FLOURESCENT FIXTURE W/ EMERGENCY BALLAST

2'x2' RECESSED FLOURESCENT FIXTURE

1'X4' RECESSED FLOURESCENT FIXTURE W/ EMERGENCY BALLAST

LED RECESSED WALL WASHER

2 LAMP SURFACE MOUNTED FLUORESCENT FIXTURE

2 LAMP SURFACE MOUNTED FLUORESCENT FIXTURE W/ EMERGENCY BALLAST

ERL

RECESSED, EXTERIOR GRADE CAN LIGHTING

EMERGENCY LIGHT (BATTERY POWERED)

T

TRANSFORMER

EMERGENCY EXIT SIGN

PLUMBING – CIVIL

L.P.

LIGHT POLE WITH A 36" HIGH CONCRETE BASE

FH

FIRE HYDRANTS

IRR

IRRIGATION PIPE

NOTE: NOT ALL SYMBOLS ARE USED. SEE OTHER SPECIFIC SYMBOL LEGENDS ON EACH DRAWING WHERE OCCURS.

GENERAL NOTES

THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, AND A201 LATEST EDITION OF THE AMERICAN INSTITUTE OF ARCHITECTS, ARE HEREBY MADE PART OF CONTRACT DOCUMENTS TO THE SAME EXTENT AS IF BOUND HEREIN.

THE CONTRACTOR SHALL PROVIDE ADEQUATE CONTRACTOR'S LIABILITY AND "ALL RISK" INSURANCE TO COVER 100% OF THE COST OF THE PROJECT. PROVIDE WORKMEN'S COMPENSATION AS REQUIRED BY LAW AND PROVIDE OTHER INSURANCE REQUIRED BY GENERAL CONDITIONS, LANDLORD, LAW OR CODE.

ALL SUBCONTRACTORS MUST BE PRE–APPROVED BY CITY OF PHARR ENGINEER, MR. OMAR ANZALDUA JR., PE, CFM, PMP, AND THE WARREN GROUP ARCHITECTS INC.

GENERAL CONTRACTOR AND SUBCONTRACTORS SHALL PROVIDE, PRIOR TO CONSTRUCTION, UNIT PRICES FOR ALL WORK SHOWN. THESE PRICES SHALL BE VALID FOR THE DURATION OF THE PROJECT AND USED FOR ALL SUBMISSIONS REGARDING ADDITIONS OR DELETIONS TO SCOPE OF WORK.

UNLESS OTHERWISE STIPULATED, THE GENERAL CONTRACTOR SHALL PROVIDE AND PAY FOR ALL MATERIALS, LABOR, TAXES, WATER, TOOLS, EQUIPMENT, LIGHT, POWER, TRANSPORTATION AND OTHER FACILITIES NECESSARY FOR THE EXECUTION AND COMPLETION OF THE WORK.

THE CONTRACTOR AND HIS SUB–CONTRACTORS SHALL KEEP WORK AREA IN A CLEAN AND ORDERLY MANNER, REMOVING DEBRIS ON A ROUTINE BASIS.

CONTRACTOR REVIEW:

GENERAL CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL CONTRACT DOCUMENTS, FIELD CONDITIONS AND DIMENSION FOR ACCURACY AND CONFIRMING THAT WORK IS BUILDABLE, AS SHOWN, BEFORE SUBMITTING FINAL PRICING AND PROCEEDING WITH CONSTRUCTION. FAILURE TO REPORT A CONFLICT IN THE CONTRACT DOCUMENTS SHALL BE DEEMED EVIDENCE THAT THE CONTRACTOR HAS ELECTED TO PROCEED IN THE MORE EXPENSIVE MANNER.

CONTRACTOR IS RESPONSIBLE TO PERFORM ALL WORK IN ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES HAVING JURISDICTION.

PROJECT TEAM

OWNER:

City of Pharr
Contact: Omar Anzaldua Jr., PE, CFM, PMP
Address: 118 S. Cage Blvd. 4th Floor
Pharr, Texas 78577
956.402.4221 Office
956.540.9122 Cell
omar.anzaldua@pharr–tx.gov

ARCHITECT□

The Warren Group Architects. Inc.
Contact: Laura Nassri Warren, AIA.
1801 S. 2nd St. Suite 330
McAllen, Texas 78503
956.994.1900
956.994.1962 fax
lwarren@twgarch.com

CONSULTANTS□

POOL CONSULTANT□

Cousilman–Hunsaker
Darren Bevard, P.E.
Staci Pye
2425 North Central Expressway
Suite 359
Richardson, TX 75080
972.370.3740 Office
darrenbevard@chh2o.com
StaciPye@chh2o.com

CIVIL ENGINEER□

Perez Consulting Engineering
Jorge D. Perez, P.E., R.P.L.S
808 Dallas Ave.
McAllen, Texas 78501
956.631.4482 Office
jdp@perezce.com

MEP ENGINEER□

MEP Solutions, Inc.
Contacts: Luis Javier Pena, PE
Abram L. Dominguez, PE
600 E Beaumont Ave. Suite 2
McAllen, Texas 78501
956.664.2727
956.664.2726 fax
jpena@mepsolutionsengineering.com
adominguez@mepsolutionsengineering.com

STRUCTURAL ENGINEER□

Solorio Inc.
Contact: Simon Solorio, P.E.
108 W. 18th Street
Mission, Texas 78572
956.631.1500
simon@solorio.com

LANDSCAPE AND IRRIGATION□

Earth Irrigation and Landscaping
Wille Gossett
1101 E. Violet Ave.
McAllen, Texas 78504
956.631.6686 Office
956.631.6688 Fax
willieg@earthirrigation.com

MATERIALS

CAST IN PLACE CONCRETE

PRECAST CONCRETE

STEEL

METAL STUDS

GLASS

CONCRETE MASONRY UNITS

LANDSCAPE AREA

WOOD BLOCKING

ROUGH WOOD

FINISH WOOD

PLYWOOD

RIGID INSULATION

BATT INSULATION

CODE CHECK

GENERAL □PROJECT IDENTIFICATION

LIST OF APPLICABLE CODES (TITLES & EDITIONS)
–TEXAS ACCESSIBILITY STANDARDS (TAS), 2012 EDITION.
–INTERNATIONAL BUILDING CODE (IBC), 2012 EDITION.
–INTERNATIONAL ENERGY CONSERVATION CODE(IECC), 2015 EDITION.
–INTERNATIONAL FIRE CODE (IFC), 2012 EDITION.
–NFPA 101, 2012 EDITION
–TEXAS ADMINISTRATIVE CODE –TITLE 25 – CHAPTER 265 – SUBCHAPTER L STANDARDS FOR PUBLIC POOLS AND SPAS
–MAHC – MODEL AQUATIC HEALTH CODE
–NFHSA – NATIONAL FEDERATION OF STATE HIGH SCHOOL ASSOCIATIONS
–USAS – USA SWIMMING
–NCAA – NATIONAL COLLEGIATE ATHLETIC ASSOCIATION
–UIL – UNIVERSITY INTERSCHOLASTIC LEAGUE

LIST OF APPLICABLE ORDINANCES AND JURISDICTIONS
CITY OF PHARR CODE OF ORDINANCES, CURRENT EDITION.

PROJECT DESCRIPTION

APPROXIMATE SITE AREA:	9.19 ACRES
FIRST LEVEL:	65,398 S.F.
SECOND LEVEL:	7,398 S.F.
TOTAL BUILDING GROSS AREA:	72,796 S.F.
SECOND LEVEL ALTERNATE:	1,212 S.F.

□ONING / ORDINANCE REQUIREMENTS

PARKING REQUIRED :	349 SPACES
PARKING PROVIDED :	444 SPACES

ACCESSIBILITY DESIGN CRITERIA (TAS□ADA)

EXTERIOR ACCESSIBLE PARKING SPACES ADA– TABLE 208.2	
REQUIRED	9 ACC SPACES
PROVIDED	10 SPACES

BUILDING DESIGN CRITERIA □2012 IBC CODE

USE GROUP (OCCUPANCY) CLASSIFICATION(S)

MAIN:	ASSEMBLY WITH FIXED SEATING (A–4)
ACCESSORY CLASSIFICATION	BUSINESS (B) EDUCATION (E)
TYPE OF CONSTRUCTION	TYPE II–B UNPROTECTED, SPRINKLERED

ALLOWABLE BUILDING HEIGHT AND AREA:

ALLOWABLE BUILDING AREA IBC 2012 EDITION, TABLE 507.3	UNLIMITED
ACTUAL AREA	74,008 S.F.
ALLOWABLE BUILDING HEIGHT IBC 2012 EDITION, TABLE 504.2	2 STORIES – 75FT.
ACTUAL BUILDING HEIGHT:	1 STORY – 68'–3"

OCCUPANCY LOADS: (PER TABLE 1004.1.2)

ASSEMBLY (A–4)	1,511 OCCUPANCY LOAD
BUSINESS (B)	96 OCCUPANCY LOAD
EDUCATION (E)	43 OCCUPANCY LOAD

PLUMBING FIXTURE REQUIREMENTS:

WATER CLOSETS:	REQUIRED:	PROVIDED:
A–4	30	30
B	3	3
E	1	1
TOTAL	34	36 (6 URINALS)
LAVATORIES		
A–4	9	22
B	3	3
E	1	1
TOTAL	13	26
SHOWERS		
A–4	–	16

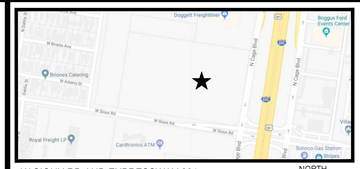
NOTES:

1. ALL REQUIRED PERMITS MUST BE OBTAINED FROM THE CITY OF PHARR FIRE DEPARTMENT BEFORE THE BUILDING IS OCCUPIED.
2. EXIT DOORS TO BE OPERABLE FROM INSIDE WITHOUT USE OF A KEY OR SPECIAL KNOWLEDGE OR EFFORT.

INDEX OF DRAWINGS

ARCHITECTURAL DRAWINGS

VICINITY MAP



W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

NORTH

THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, AND A201 LATEST EDITION OF THE AMERICAN INSTITUTE OF ARCHITECTS, ARE HEREBY MADE PART OF CONTRACT DOCUMENTS TO THE SAME EXTENT AS IF BOUND HEREIN.

ALL CONSTRUCTION SHALL COMPLY WITH AMERICAN'S WITH DISABILITIES ACT, PUBLIC LAW 101–336 AND TAS COMPLIANT.

GENERAL CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL CONTRACT DOCUMENTS, FIELD CONDITIONS AND DIMENSIONS FOR ACCURACY AND CONFIRMING THAT WORK IS BUILDABLE, AS SHOWN, BEFORE SUBMITTING FINAL PRICING FOR THE WORK IN QUESTION OR RELATED WORK.

INDEX OF DRAWINGS

CIVIL DRAWINGS

LANDSCAPE DRAWINGS

STRUCTURAL DRAWINGS

POOL CONSULTANT DRAWINGS

M.E.P. DRAWINGS

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

SEAL

REGISTERED ARCHITECT
LAURA NASSRI WARREN
18378
STATE OF TEXAS

EXP 10–31–19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

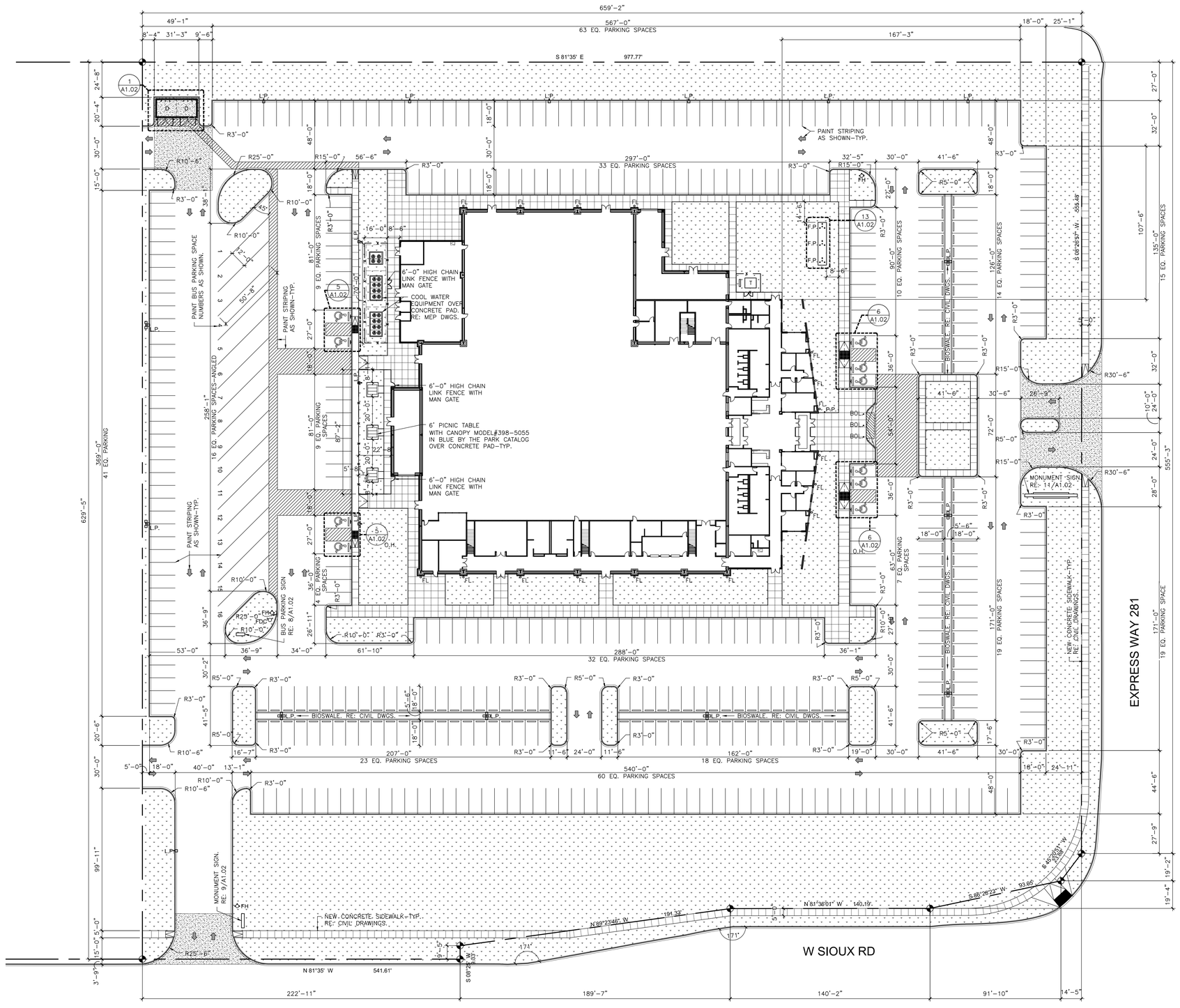
G0.01
GENERAL NOTES, ABBREVIATIONS & SYMBOLS

SHEET NOTES

1. SITE PLAN CURBS DIMENSIONED TO FRONT OF CURB.
2. REFER CIVIL DRAWINGS FOR DEMOLITION SCOPE.
3. REFER CIVIL DRAWINGS FOR NEW CONCRETE PAVING, SIDEWALKS, AND SITE DIMENSIONAL CONTROL PLAN.
4. REFER CIVIL DRAWINGS FOR GRADING ELEVATIONS/SPOT ELEVATIONS.
5. REFER TO MECHANICAL & ELECTRICAL DRAWINGS FOR TRANSFORMER AND GENERATOR PAD CONSTRUCTION DETAILS.

SHEET LEGEND

- LANDSCAPE AND IRRIGATED AREA. RE: LANDSCAPE DRAWINGS.
- CONCRETE PAVING. RE: CIVIL DRAWINGS.
- D — DUMPSTER
- T — TRANSFORMER PAD RE: ELEC. DWGS.
- L.P. — LIGHT POLE RE: ELECTRICAL DRAWINGS
- BOL. — PIPE BOLLARD RE: 3/A1.02
- F.P. — 45' TALL FLAG POLE
- 6'-0" HIGH CHAIN LINK FENCE
- F.H. — FIRE HYDRANT RE: CIVIL DRAWINGS
- F.D.C. — FIRE DEPARTMENT CONNECTION RE: CIVIL DRAWINGS
- PRE-CAST CONCRETE WHEEL STOP WHERE NOTED
- FL — FLOODLIGHT RE: ELECTRICAL DRAWINGS
- P.P. — PUSH PLATE



NORTH

1 SITE PLAN
SCALE: 1" = 30'-0"

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL
REGISTERED ARCHITECT
TBPA 18378
18378
STATE OF TEXAS
EXP 10-31-19

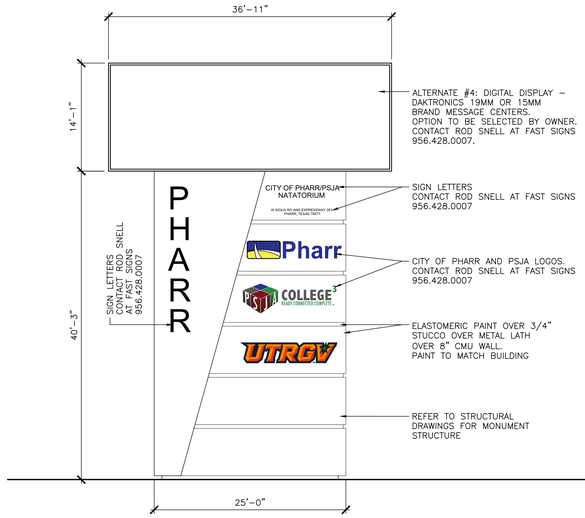
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

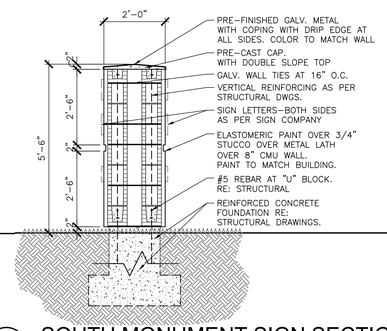
3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

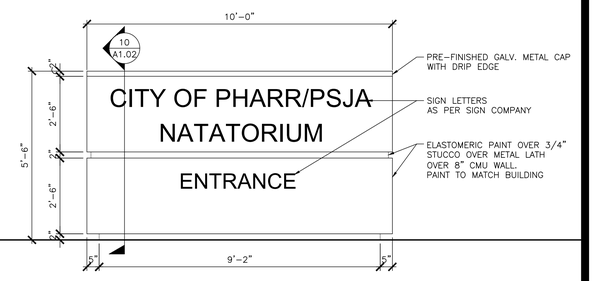
A1.01
SITE PLAN



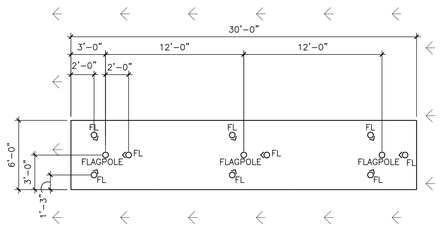
11 ELEVATION
EAST MONUMENT SIGN
SCALE: 1/8" = 1'-0"



10 SOUTH MONUMENT SIGN SECTION
SCALE: 1/2" = 1'-0"



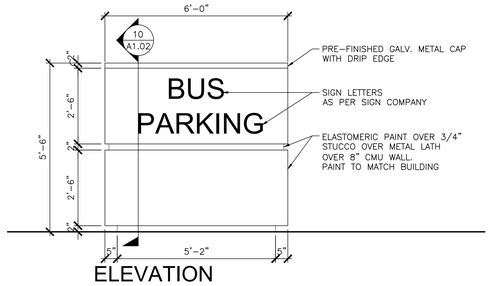
9 ELEVATION
SOUTH MONUMENT SIGN
SCALE: 1/2" = 1'-0"



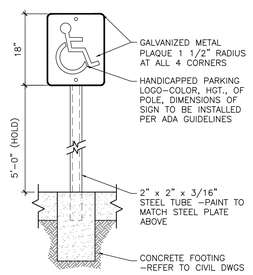
13 FLAGPOLE PLINTH
SCALE: 3/16" = 1'-0"
SITE_DETL_008

NOTE:

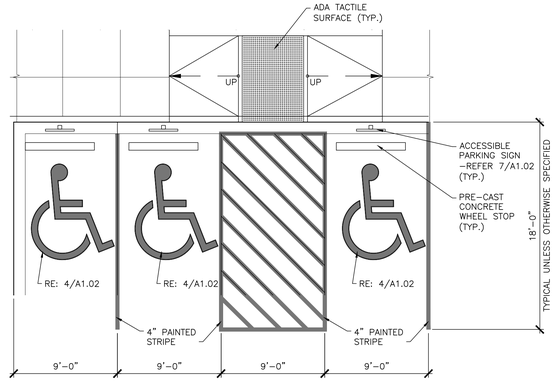
1. SIGNS SHOULD BE PROPERLY CENTERED AT FRONT OF PARKING SPACE
2. SIGN FACE SHOULD BE LOCATED NO FURTHER THAN 6' FROM THE FRONT OF EACH PARKING SPACE WITH MINIMUM 3'-0" CLEAR
3. MOUNT SIGN ON COLUMN OR WALL AT SIM. CONDITION
4. WHERE SIGN IS PLACED IN PAVED AREA AT PARKING STALLS, PROVIDE PRECAST BUMPERS
5. PROVIDE "VAN ACCESSIBLE" SIGN AS SHOWN AT VAN ACCESSIBLE PARKING SPACE



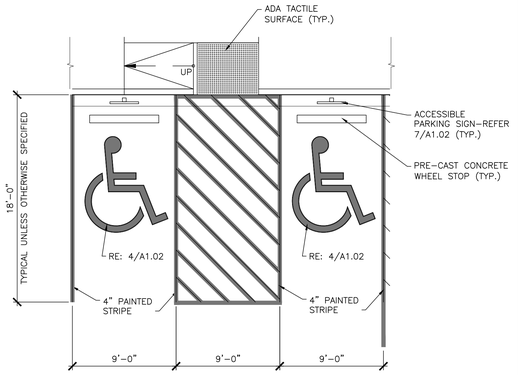
8 ELEVATION
BUS PARKING SIGN
SCALE: 1/2" = 1'-0"



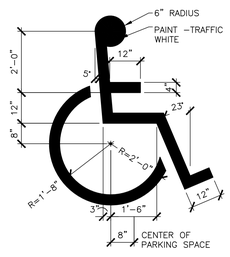
7 ACCESSIBLE SIGN DETAIL
NOT TO SCALE
SITE_DETL_004



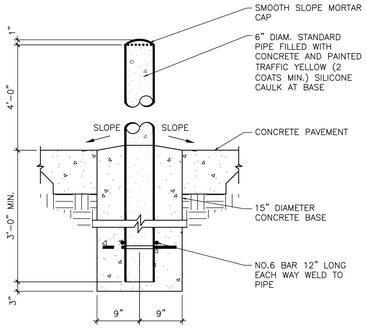
6 ACCESSIBLE PARKING DETAIL
SCALE: 3/16" = 1'-0"
SITE_DETL_006



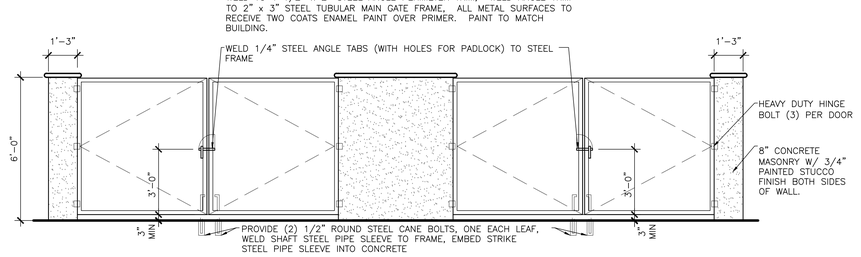
5 ACCESSIBLE PARKING DETAIL
SCALE: 3/16" = 1'-0"
SITE_DETL_005



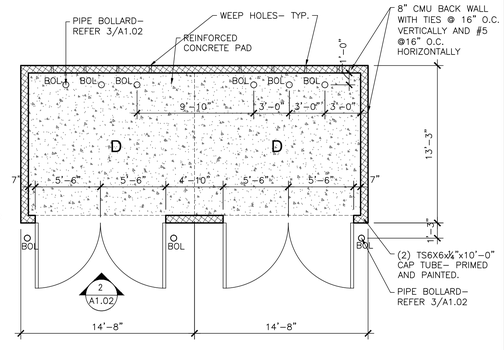
4 ACCESSIBLE PARKING SYMBOL
NOT TO SCALE
SITE_DETL_007



3 PIPE BOLLARD A DETAIL
SCALE: 3/8" = 1'-0"
SITE_DETL_003



2 DUMPSTER ENCLOSURE ELEVATION
SCALE: 1/2" = 1'-0"
SITE_DETL_02



1 DUMPSTER ENCLOSURE DETAIL
SCALE: 3/16" = 1'-0"
SITE_DETL_01

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

SEAL
REGISTERED ARCHITECT
18378
STATE OF TEXAS
EXP 10-31-19

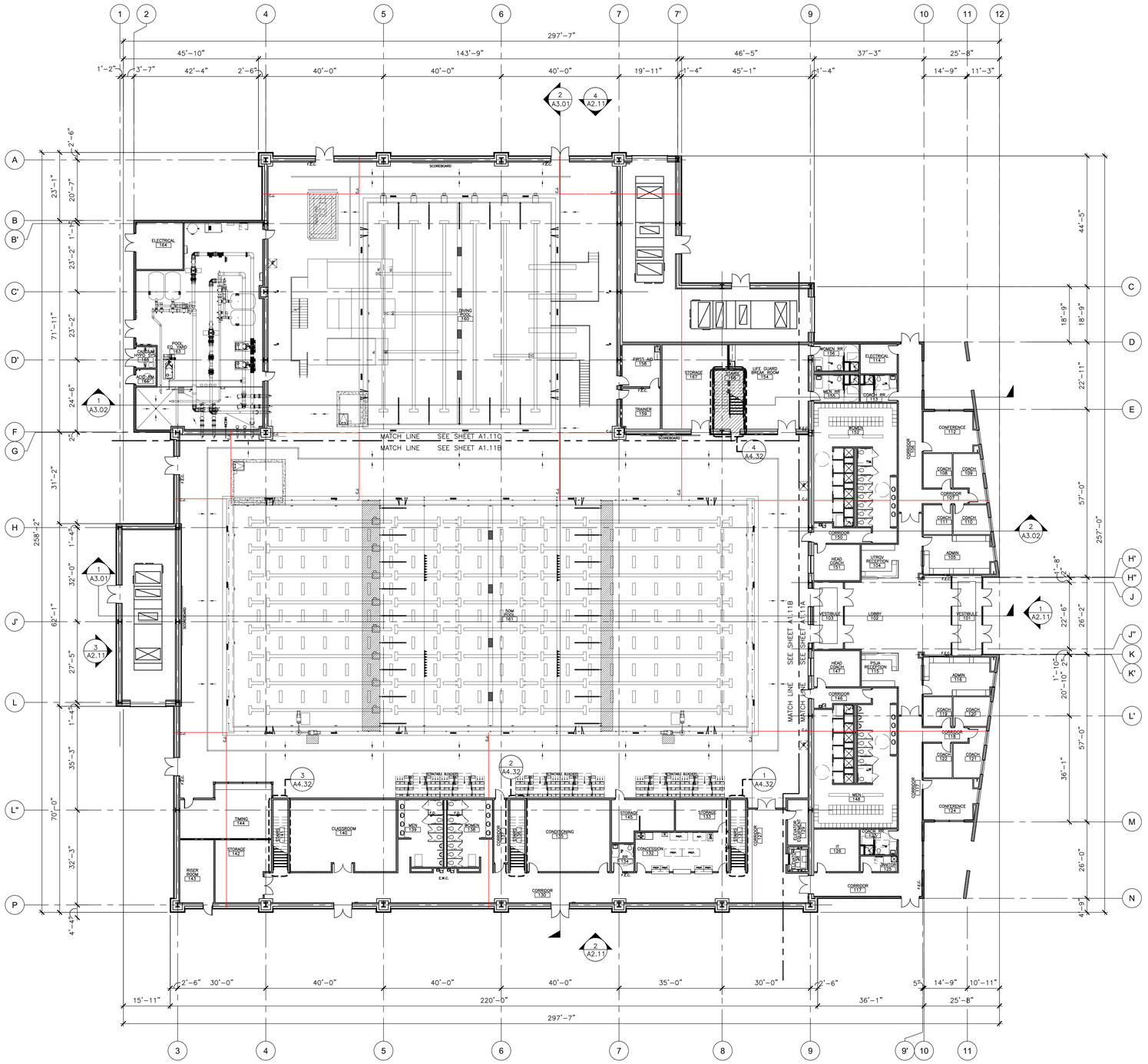
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

A1.02
SITE PLAN DETAILS



NORTH

1 FLOOR PLAN - FIRST FLOOR

SCALE: 1/16" = 1'-0"

SHEET NOTES

1. DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATIONS, IF NEEDED.
2. DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED AND NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. ALL DOOR FRAMES ARE TO BE INSTALLED 4" MIN. AWAY OF ADJACENT PERPENDICULAR WALLS UNLESS OTHERWISE NOTED.
4. REFER TO STRL DWGS FOR ADDITIONAL STRUCTURAL SPECIFIC INFORMATION.
5. REFER TO MEP DWGS FOR ADDITIONAL MEP SPECIFIC INFORMATION.
6. REFER TO POOL CONSULTANT DWGS FOR ADDITIONAL POOL SPECIFIC INFORMATION.
7. REFER TO ROOF PLAN FOR ROOF DRAIN LOCATIONS.
8. REFER TO G0.01 FOR KEYS AND SYMBOLS.

SHEET LEGEND

ALTERNATE. SEE SPECIFICATIONS.

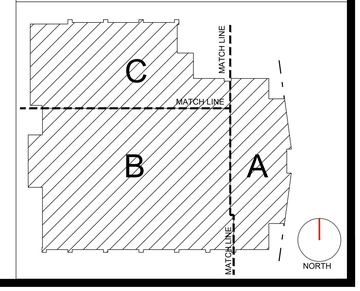
MATCH LINE

F.E.C.	FIRE EXTINGUISHER IN RECESSED CABINET
E.W.C.	HI-LO ELECTRICAL WATER COOLER
FD.	FLOOR DRAIN
RD.	ROOF DRAIN
O.D.	OVERFLOW DRAIN
P.P.	ADA PUSH PLATE
C.J.	CONTROL JOINT REFER 3/A5.11

WALL LEGEND

	1HR. FIRE RATED WALL
XX	INTERIOR WALL TYPE RE: A6.01 FOR WALL TYPES
EWA-#	EXTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES
IWA-#	INTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES

KEY PLAN



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY:	DESCRIPTION

SEAL

REGISTERED ARCHITECT JUAN M. WARREN 18376 STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.11

OVERALL FIRST FLOOR PLAN

SHEET NOTES

1. DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATIONS, IF NEEDED.
2. DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED AND NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. ALL DOOR FRAMES ARE TO BE INSTALLED 4" MIN. AWAY OF ADJACENT PERPENDICULAR WALLS UNLESS OTHERWISE NOTED.
4. REFER TO STRL DWGS FOR ADDITIONAL STRUCTURAL SPECIFIC INFORMATION.
5. REFER TO MEP DWGS FOR ADDITIONAL MEP SPECIFIC INFORMATION.
6. REFER TO POOL CONSULTANT DWGS FOR ADDITIONAL POOL SPECIFIC INFORMATION.
7. REFER TO ROOF PLAN FOR ROOF DRAIN LOCATIONS.
8. REFER TO G0.01 FOR KEYS AND SYMBOLS.

SHEET LEGEND

ALTERNATE. SEE SPECIFICATIONS.

MATCH LINE

F.E.C.	FIRE EXTINGUISHER IN RECESSED CABINET
E.W.C.	HI–LO ELECTRICAL WATER COOLER
FD.	FLOOR DRAIN
RD.	ROOF DRAIN
O.D.	OVERFLOW DRAIN
P.P.	ADA PUSH PLATE
C.J.	CONTROL JOINT REFER 3/A5.11

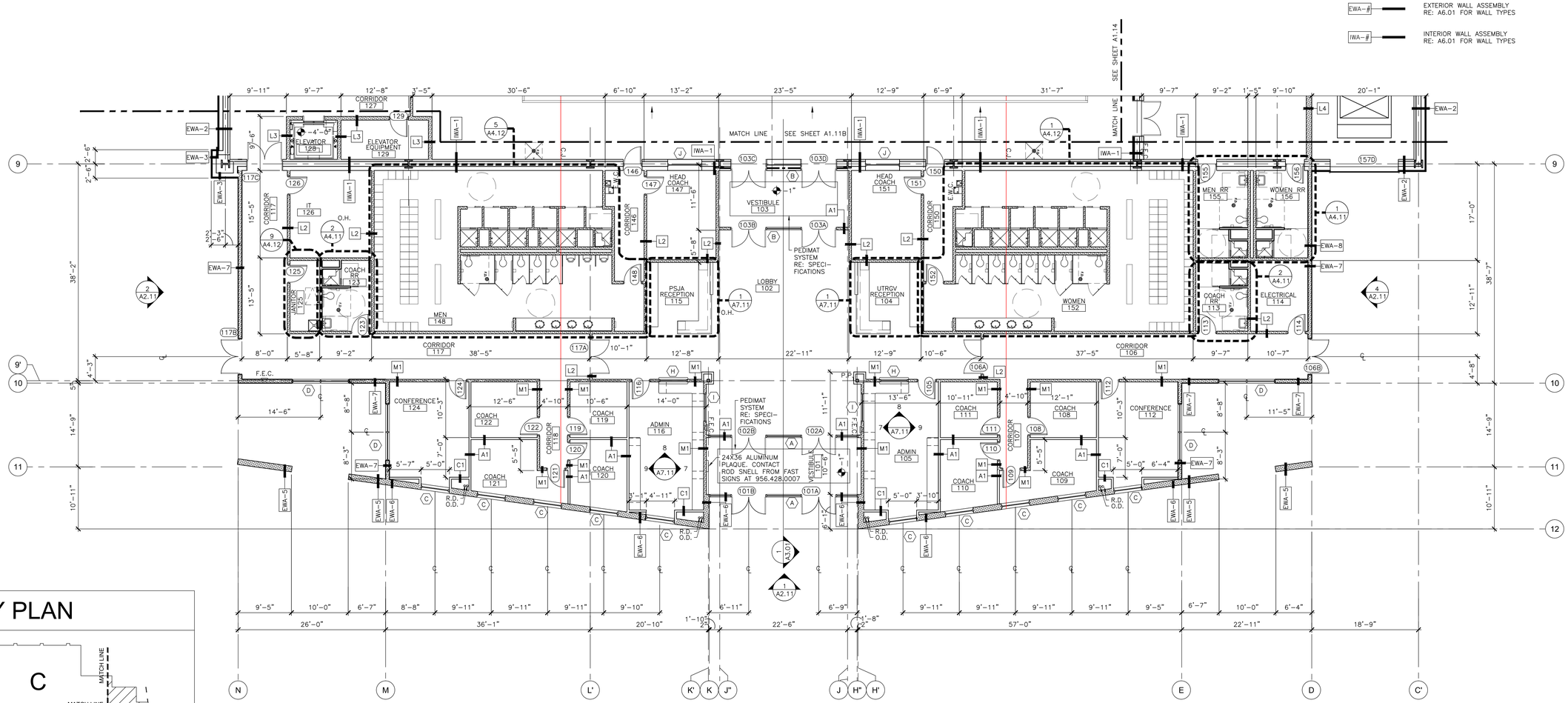
WALL LEGEND

1HR. FIRE RATED WALL

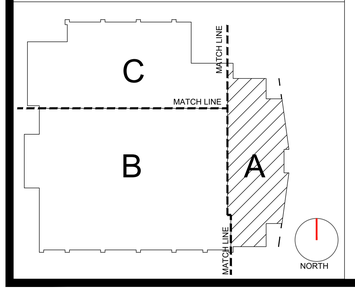
XX — INTERIOR WALL TYPE RE: A6.01 FOR WALL TYPES

EWA–# — EXTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES

IWA–# — INTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES



KEY PLAN



NORTH

1 FLOOR PLAN A

SCALE: 1/8" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT — 18378 — STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.11A
FLOOR PLAN A

SHEET NOTES

1. DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATIONS, IF NEEDED.
2. DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED AND NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. ALL DOOR FRAMES ARE TO BE INSTALLED 4" MIN. AWAY OF ADJACENT PERPENDICULAR WALLS UNLESS OTHERWISE NOTED.
4. REFER TO STRL DWGS FOR ADDITIONAL STRUCTURAL SPECIFIC INFORMATION.
5. REFER TO MEP DWGS FOR ADDITIONAL MEP SPECIFIC INFORMATION.
6. REFER TO POOL CONSULTANT DWGS FOR ADDITIONAL POOL SPECIFIC INFORMATION.
7. REFER TO ROOF PLAN FOR ROOF DRAIN LOCATIONS.
8. REFER TO G0.01 FOR KEYS AND SYMBOLS.

SHEET LEGEND

	ALTERNATE. SEE SPECIFICATIONS.
	MATCH LINE
F.E.C.	FIRE EXTINGUISHER IN RECESSED CABINET
E.W.C.	HI-LO ELECTRICAL WATER COOLER
FD.	FLOOR DRAIN
RD.	ROOF DRAIN
O.D.	OVERFLOW DRAIN
P.P.	ADA PUSH PLATE
C.J.	CONTROL JOINT REFER 3/A5.11

WALL LEGEND

	1HR. FIRE RATED WALL
XX	INTERIOR WALL TYPE RE: A6.01 FOR WALL TYPES
EWA-#	EXTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES
IWA-#	INTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES

MATCH LINE SEE SHEET A1.11C

SEE SHEET A1.11A MATCH LINE

TRENCH DRAIN. RE: PLUMBING DRAWINGS

AIR HANDLING UNIT. RE: MECHANICAL DRAWINGS

ALTERNATE #3— LED SCOREBOARD. RE: SPECIFICATIONS.

SCOREBOARD

50M POOL 161

50M COMPETITION POOL. RE: POOL CONSULTANT DRAWINGS

VERSATRACT TELESCOPIC SEATING SYSTEM BY IRWIN SEATING COMPANY. SEE SPECIFICATIONS.

RETRACTABLE BLEACHERS

MECHANICAL 162

TIMING 144

STAIRS 141

CLASSROOM 140

MEN 139

WOMEN 138

STAIRS 136

CONDITIONING 135

21'-0" TALL FRAMED MIRROR

STAIRS 131

STORAGE 145

STORAGE 133

CONCESSION 132

RR 134

CORRIDOR 127

RISER ROOM 143

STORAGE 142

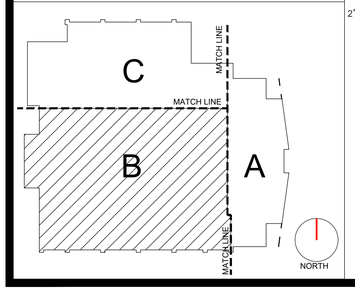
CORRIDOR 130

E.W.C.

F.E.C.

R.D. O.D.

KEY PLAN



NORTH

1 FLOOR PLAN B
SCALE: 1/8" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT — 18378 — STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.11B
FLOOR PLAN B

SHEET NOTES

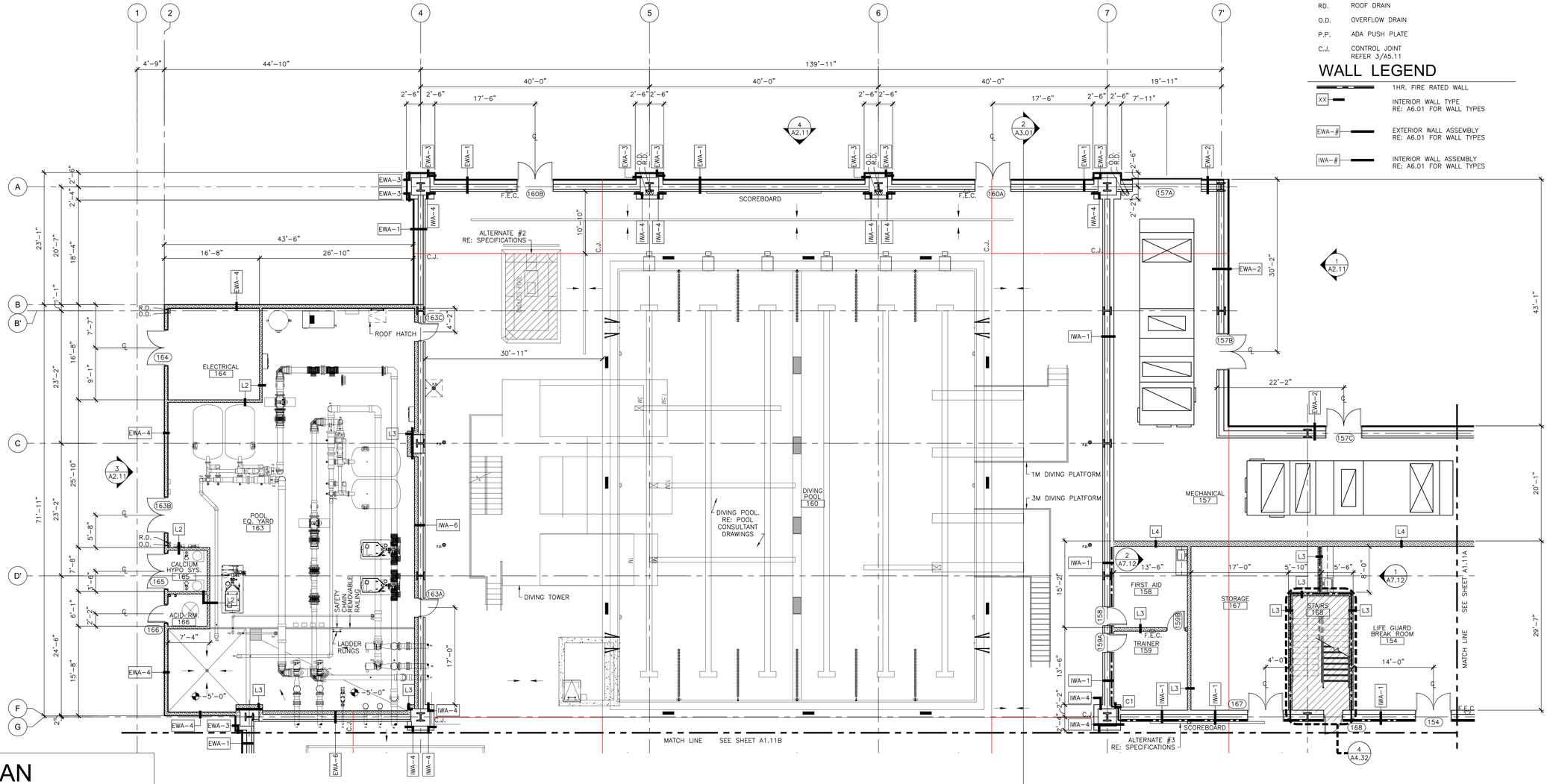
1. DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATIONS, IF NEEDED.
2. DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED AND NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. ALL DOOR FRAMES ARE TO BE INSTALLED 4" MIN. AWAY OF ADJACENT PERPENDICULAR WALLS UNLESS OTHERWISE NOTED.
4. REFER TO STRL DWGS FOR ADDITIONAL STRUCTURAL SPECIFIC INFORMATION.
5. REFER TO MEP DWGS FOR ADDITIONAL MEP SPECIFIC INFORMATION.
6. REFER TO POOL CONSULTANT DWGS FOR ADDITIONAL POOL SPECIFIC INFORMATION.
7. REFER TO ROOF PLAN FOR ROOF DRAIN LOCATIONS.
8. REFER TO G0.01 FOR KEYS AND SYMBOLS.

SHEET LEGEND

	ALTERNATE. SEE SPECIFICATIONS.
	MATCH LINE
F.E.C.	FIRE EXTINGUISHER IN RECESSED CABINET
E.W.C.	HI-LO ELECTRICAL WATER COOLER
FD.	FLOOR DRAIN
RD.	ROOF DRAIN
O.D.	OVERFLOW DRAIN
P.P.	ADA PUSH PLATE
C.J.	CONTROL JOINT REFER 3/A5.11

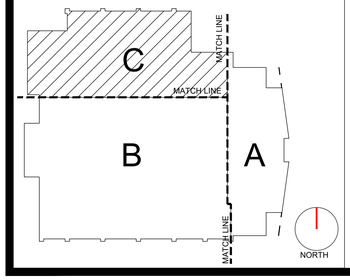
WALL LEGEND

	1HR. FIRE RATED WALL
XX	INTERIOR WALL TYPE RE: A6.01 FOR WALL TYPES
EWA-#	EXTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES
IWA-#	INTERIOR WALL ASSEMBLY RE: A6.01 FOR WALL TYPES



1 FLOOR PLAN - C
SCALE: 1/8" = 1'-0"

KEY PLAN



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL
REGISTERED ARCHITECT
CHRISTINA M. WARREN
18378
STATE OF TEXAS
EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.11C
FLOOR PLAN - C

SHEET NOTES

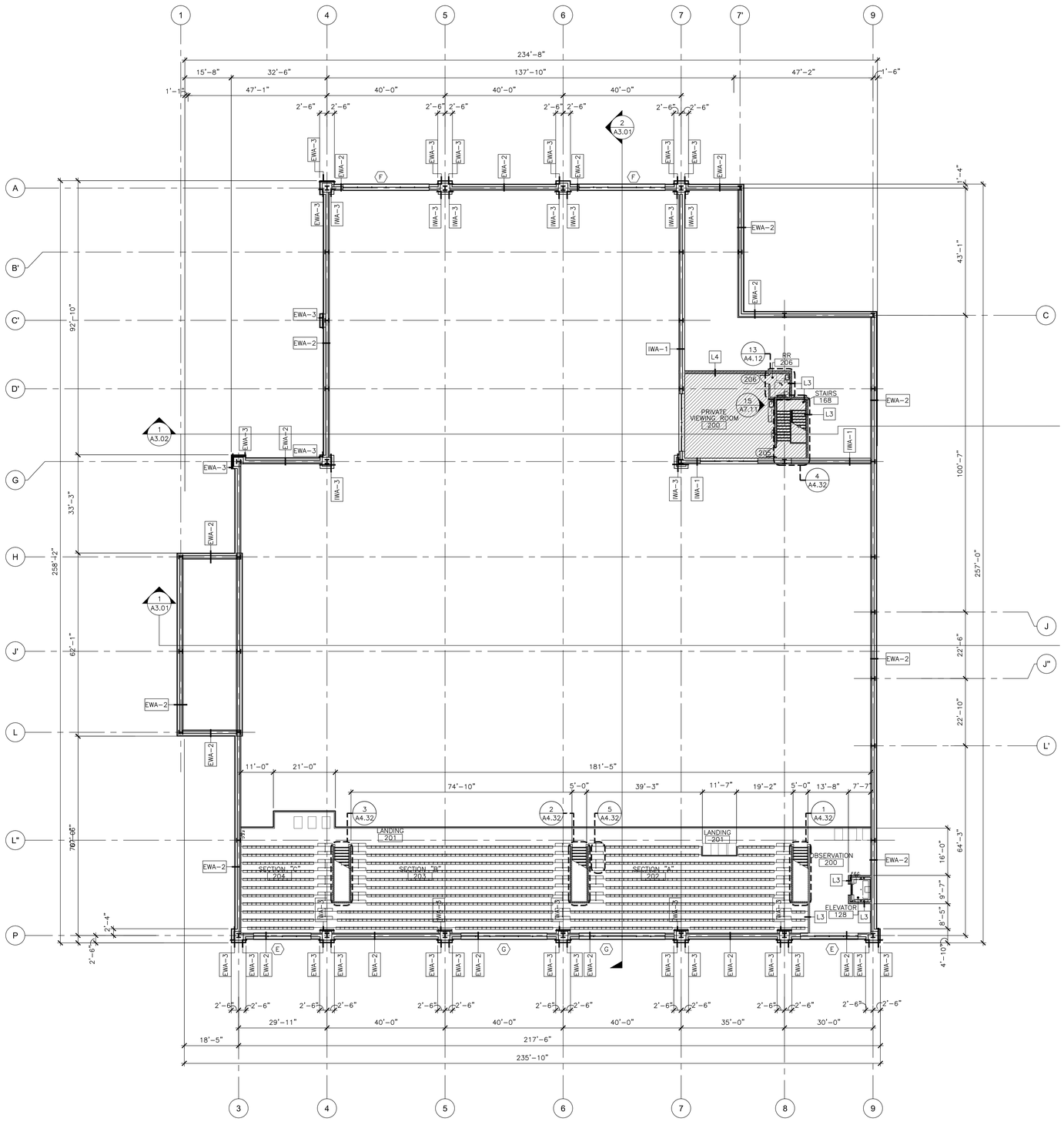
1. DRAWINGS AND SPECIFICATIONS ARE COMPLIMENTARY COMPONENTS OF THE CONTRACT DOCUMENTS. REVIEW ALL DRAWINGS AND SPECIFICATIONS FOR THE COMPLETE SCOPE OF WORK. NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATIONS, IF NEEDED.
2. DO NOT SCALE DRAWINGS. IF DIMENSIONAL INFORMATION IS REQUIRED AND NOT FOUND, NOTIFY ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. ALL DOOR FRAMES ARE TO BE INSTALLED 4" AWAY OF ADJACENT PERPENDICULAR WALLS UNLESS OTHERWISE NOTED.
4. REFER TO STRL DWGS FOR ADDITIONAL STRUCTURAL SPECIFIC INFORMATION.
5. REFER TO MEP DWGS FOR ADDITIONAL MEP SPECIFIC INFORMATION.
6. REFER TO POOL CONSULTANT DWGS FOR ADDITIONAL POOL SPECIFIC INFORMATION.
7. REFER TO ROOF PLAN FOR ROOF DRAIN LOCATIONS.
8. REFER TO G0.01 FOR KEYS AND SYMBOLS.

SHEET LEGEND

ALTERNATE. SEE SPECIFICATIONS.

MATCH LINE

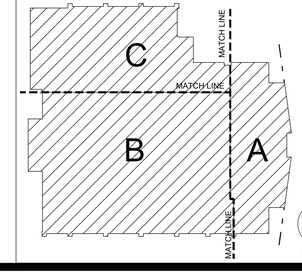
10"D X 18"W INFINITY SEATS, TREAD MOUNTED WITH GALVANIZED BRACKETS BY IRWIN SEATING COMPANY



1 FLOOR PLAN - SECOND FLOOR
SCALE: 1/16"=1'-0"

NORTH

KEY PLAN



THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18378
STATE OF TEXAS
EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

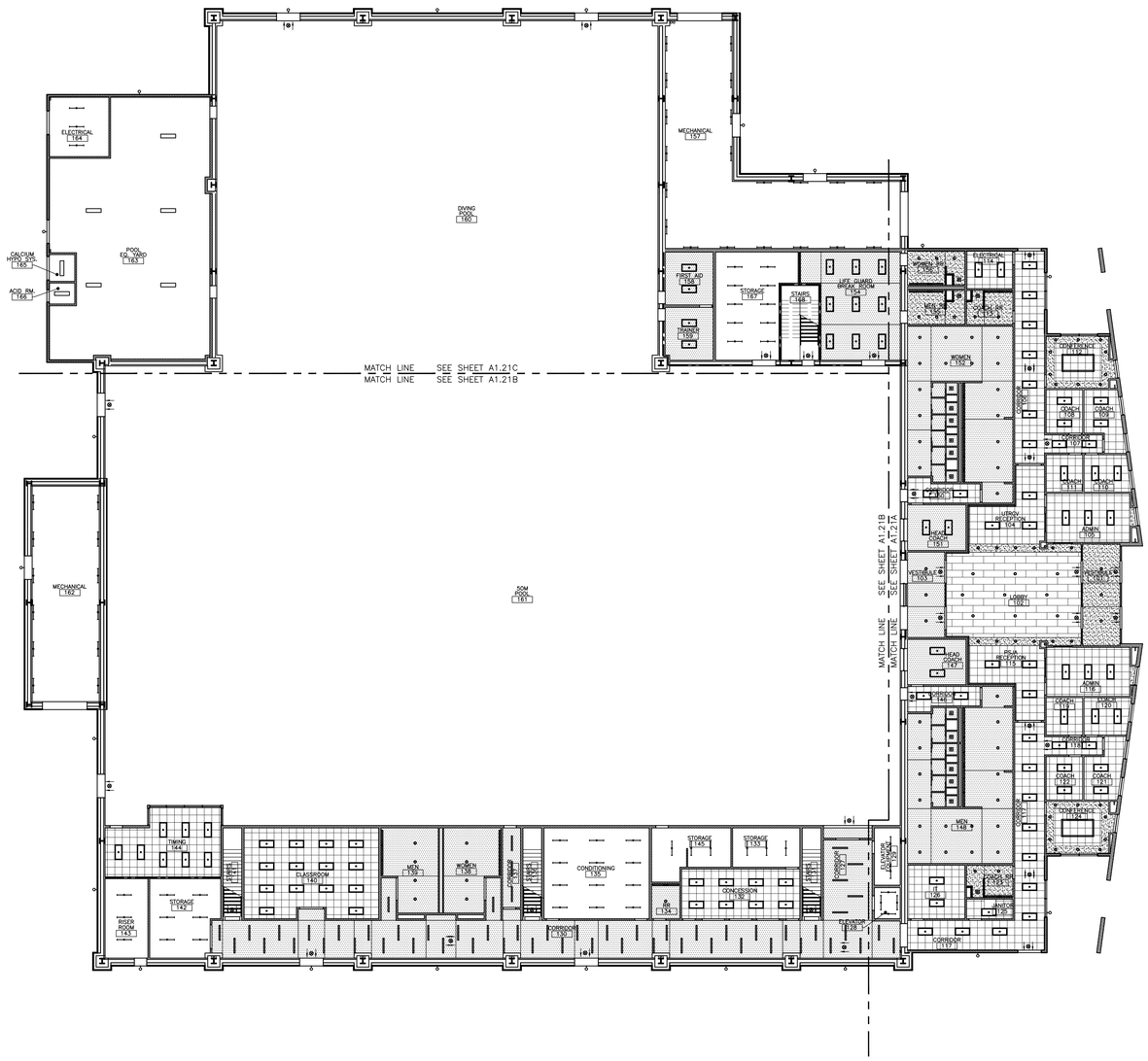
A1.12
OVERALL FLOOR PLAN SECOND FLOOR

SHEET NOTES

1. ALL CEILING HEIGHTS AT 9'-0" UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILE GRID WITHIN ROOM UNLESS DIMENSIONED OTHERWISE.
3. CENTER LIGHT FIXTURES, MECHANICAL GRILLES, AND OTHER CEILING MOUNTED DEVICES WITHIN CEILING TILES/PANELS UNLESS NOTED OTHERWISE.
4. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE TYPES, EXIT SIGNS, SWITCHING AND CIRCUITING.
5. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION PERTAINING TO HVAC AND SMOKE CONTROL DEVICES AND REQUIREMENTS.
6. G.C. TO VERIFY AND COORDINATE LOCATIONS OF ACCESS PANELS AND OTHER CEILING PENETRATING ITEMS NOT SHOWN ON THE REFLECTED CEILING PLANS.

SHEET LEGEND

- PAINTED GYPSUM BOARD
- MAGNESIACORE BOARD
- 2'X2' ACOUSTICAL CEILING TILE
- EMERGENCY EXIT LIGHT/SIGN
- WALL PACK
- 6" LED RECESSED CAN LIGHT
- 2'X4' RECESSED LIGHT
- 1'X4' SUSPENDED LIGHT FIXTURE WITH PROTECT CAGE
- 4' LED LINEAR COVE LIGHT
- 2' LED LINEAR COVE LIGHT
- LED LINEAR LIGHT
- LED HIGH BAY LUMINAIRE
- 1HR. FIRE RATED PARTITION

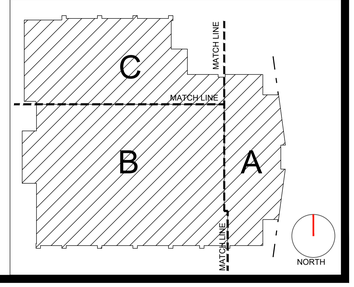


NORTH

1 OVERALL RCP FIRST FLOOR

SCALE: 1/16" = 1'-0"

KEY PLAN



TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			
4			

SEAL

REGISTERED ARCHITECT 18378 STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

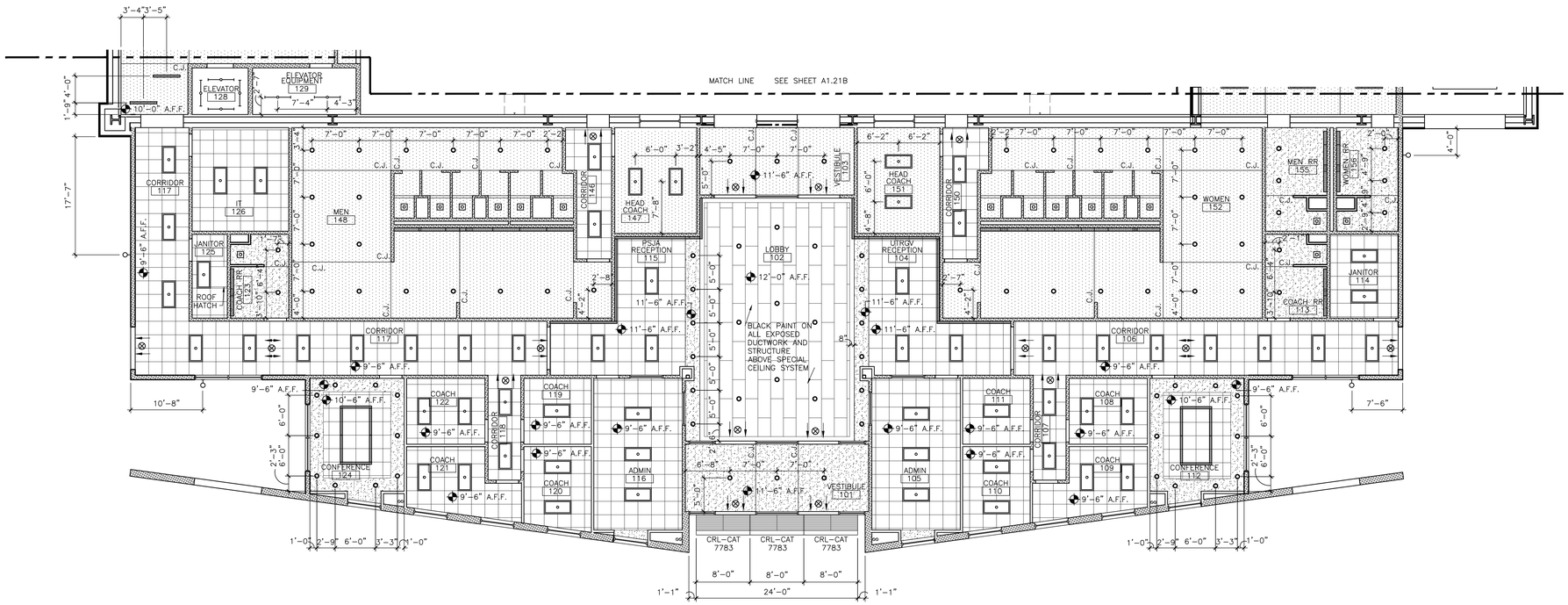
A1.21
OVERALL RCP
FIRST FLOOR

SHEET NOTES

1. ALL CEILING HEIGHTS AT 9'-0" UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILE GRID WITHIN ROOM UNLESS DIMENSIONED OTHERWISE.
3. CENTER LIGHT FIXTURES, MECHANICAL GRILLES, AND OTHER CEILING MOUNTED DEVICES WITHIN CEILING TILES/PANELS UNLESS NOTED OTHERWISE.
4. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE TYPES, EXIT SIGNS, SWITCHING AND CIRCUITING.
5. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION PERTAINING TO HVAC AND SMOKE CONTROL DEVICES AND REQUIREMENTS.
6. G.C. TO VERIFY AND COORDINATE LOCATIONS OF ACCESS PANELS AND OTHER CEILING PENETRATING ITEMS NOT SHOWN ON THE REFLECTED CEILING PLANS.

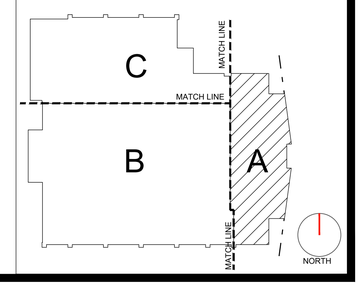
SHEET LEGEND

- PAINTED GYPSUM BOARD
- MAGNESIACORE BOARD
- 2'X2' ACOUSTICAL CEILING TILE
- EMERGENCY EXIT LIGHT/SIGN
- WALL PACK
- 6" LED RECESSED CAN LIGHT
- 2'X4' RECESSED LIGHT
- 1'X4' SUSPENDED LIGHT FIXTURE WITH PROTECT CAGE
- 4' LED LINEAR COVE LIGHT
- 2' LED LINEAR COVE LIGHT
- LED LINEAR LIGHT
- LED HIGH BAY LUMINAIRE
- 1HR. FIRE RATED PARTITION
- X'-X" C.H. CEILING HEIGHT
- C.J. CONTROL JOINT RE: 1/A5.11



1 RCP FIRST FLOOR A
SCALE: 1/8": 1'0"

KEY PLAN



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18378
STATE OF TEXAS
EXP 10-31-19

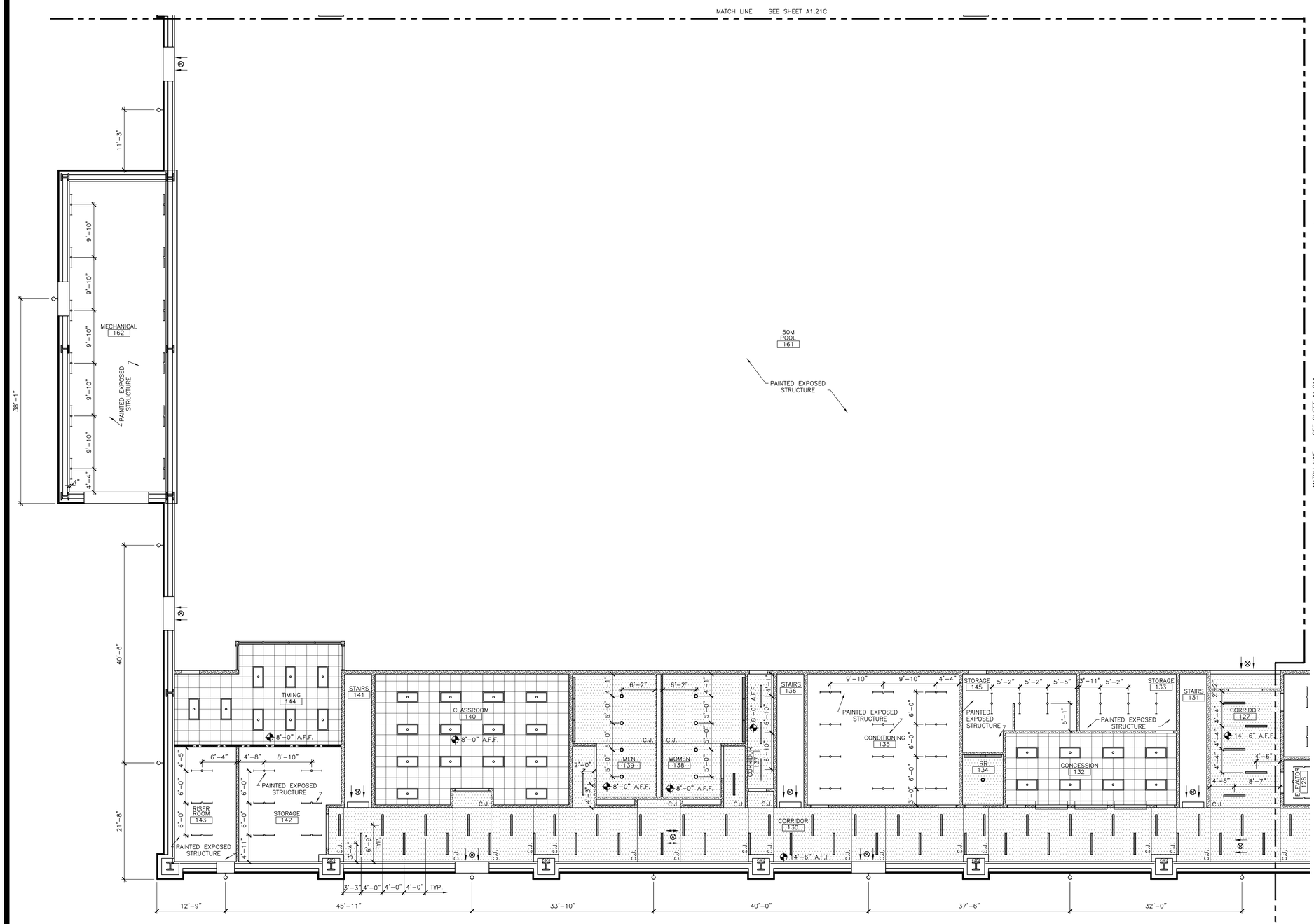
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.21A
RCP FIRST FLOOR A



SHEET NOTES

1. ALL CEILING HEIGHTS AT 9'-0" UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILE GRID WITHIN ROOM UNLESS DIMENSIONED OTHERWISE.
3. CENTER LIGHT FIXTURES, MECHANICAL GRILLES, AND OTHER CEILING MOUNTED DEVICES WITHIN CEILING TILES/PANELS UNLESS NOTED OTHERWISE.
4. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE TYPES, EXIT SIGNS, SWITCHING AND CIRCUITING.
5. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION PERTAINING TO HVAC AND SMOKE CONTROL DEVICES AND REQUIREMENTS.
6. G.C. TO VERIFY AND COORDINATE LOCATIONS OF ACCESS PANELS AND OTHER CEILING PENETRATING ITEMS NOT SHOWN ON THE REFLECTED CEILING PLANS.

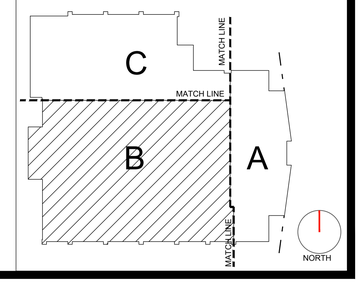
SHEET LEGEND

- PAINTED GYPSUM BOARD
- MAGNESIACORE BOARD
- 2'X2' ACOUSTICAL CEILING TILE
- EMERGENCY EXIT LIGHT/SIGN
- WALL PACK
- 6" LED RECESSED CAN LIGHT
- 2'X4' RECESSED LIGHT
- 1'X4' SUSPENDED LIGHT FIXTURE WITH PROTECT CAGE
- 4' LED LINEAR COVE LIGHT
- 2' LED LINEAR COVE LIGHT
- LED LINEAR LIGHT
- LED HIGH BAY LUMINAIRE
- 1HR. FIRE RATED PARTITION
- X'-X" C.H. CEILING HEIGHT
- C.J. CONTROL JOINT RE: 1/A5.11

NORTH

1 RCP - FIRST FLOOR - B
SCALE: 1/8" : 1'-0"

KEY PLAN



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

REVISION	DATE	APPROVED BY	DESCRIPTION
-	-	-	-

SEAL

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

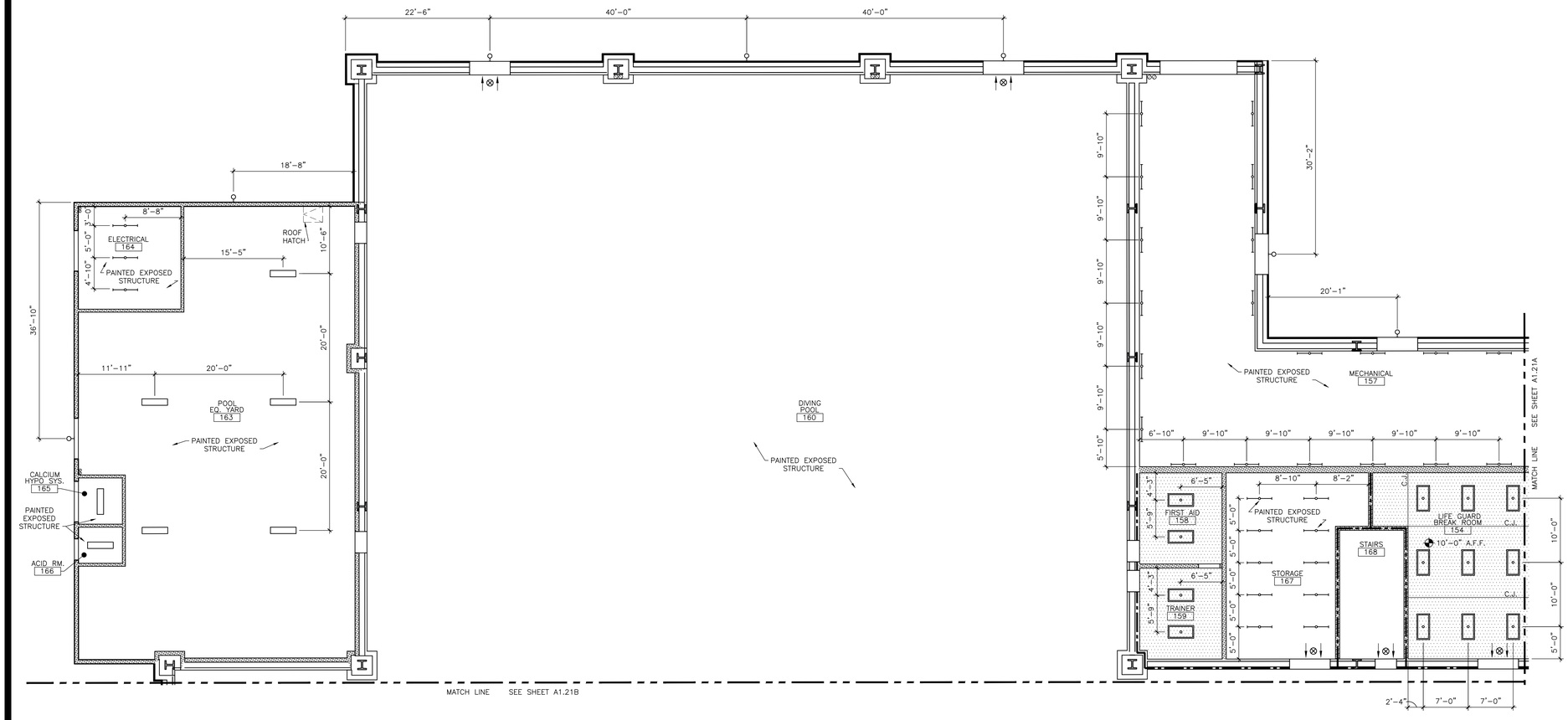
A1.21B
RCP - FIRST FLOOR - B

SHEET NOTES

1. ALL CEILING HEIGHTS AT 9'–0" UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILE GRID WITHIN ROOM UNLESS DIMENSIONED OTHERWISE.
3. CENTER LIGHT FIXTURES, MECHANICAL GRILLES, AND OTHER CEILING MOUNTED DEVICES WITHIN CEILING TILES/PANELS UNLESS NOTED OTHERWISE.
4. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE TYPES, EXIT SIGNS, SWITCHING AND CIRCUITING.
5. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION PERTAINING TO HVAC AND SMOKE CONTROL DEVICES AND REQUIREMENTS.
6. G.C. TO VERIFY AND COORDINATE LOCATIONS OF ACCESS PANELS AND OTHER CEILING PENETRATING ITEMS NOT SHOWN ON THE REFLECTED CEILING PLANS.

SHEET LEGEND

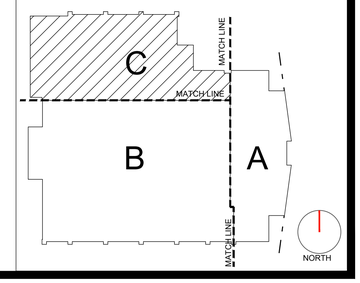
- PAINTED GYPSUM BOARD
- MAGNESIACORE BOARD
- 2'X2' ACOUSTICAL CEILING TILE
- EMERGENCY EXIT LIGHT/SIGN
- WALL PACK
- 6" LED RECESSED CAN LIGHT
- 2'X4' RECESSED LIGHT
- 1'X4' SUSPENDED LIGHT FIXTURE WITH PROTECT CAGE
- 4' LED LINEAR COVE LIGHT
- 2' LED LINEAR COVE LIGHT
- LED LINEAR LIGHT
- LED HIGH BAY LUMINAIRE
- 1HR. FIRE RATED PARTITION
- X'–X" C.H. CEILING HEIGHT
- C.J. CONTROL JOINT RE: 1/A5.11



1 RCP FIRST FLOOR C
SCALE: 1/8" = 1'0"

NORTH

KEY PLAN



TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18378
STATE OF TEXAS

EXP 10–31–19

PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

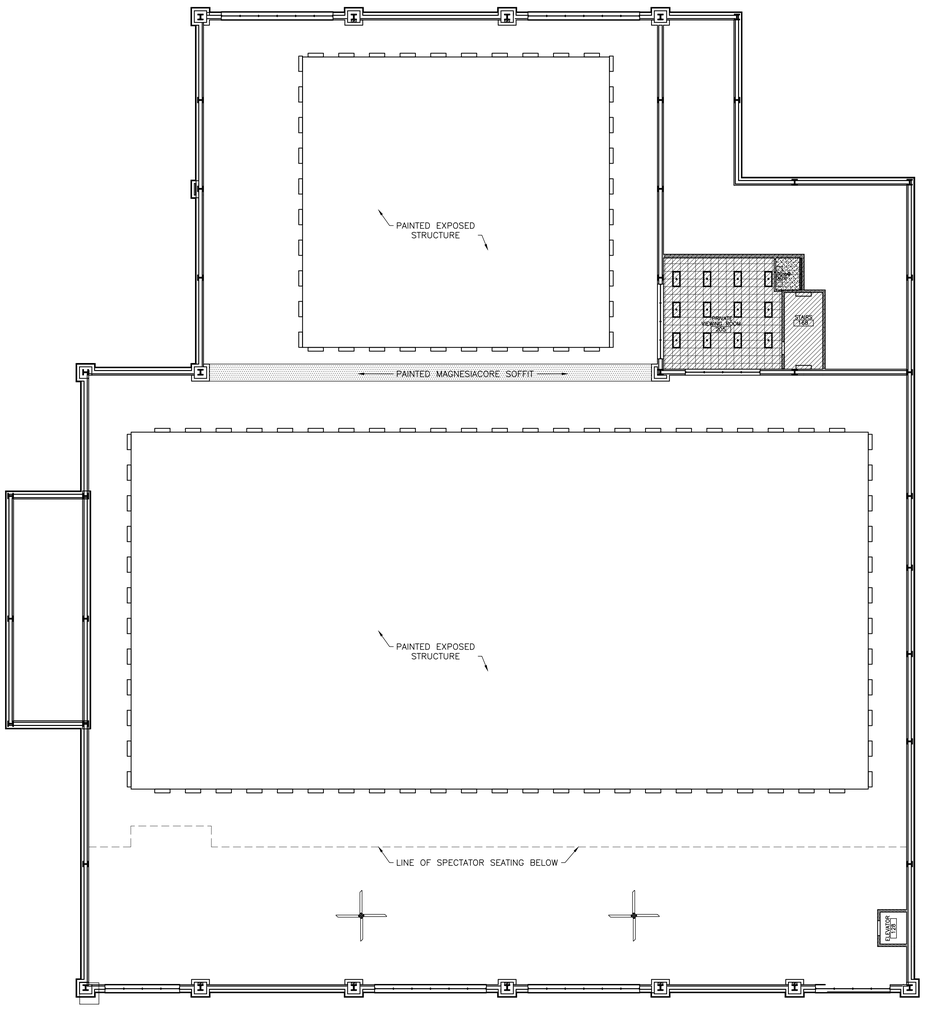
A1.21C
RCP FIRST FLOOR C

SHEET NOTES

1. ALL CEILING HEIGHTS AT 9'-0" UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILE GRID WITHIN ROOM UNLESS DIMENSIONED OTHERWISE.
3. CENTER LIGHT FIXTURES, MECHANICAL GRILLES, AND OTHER CEILING MOUNTED DEVICES WITHIN CEILING TILES/PANELS UNLESS NOTED OTHERWISE.
4. REFER TO ELECTRICAL DRAWINGS FOR LIGHT FIXTURE TYPES, EXIT SIGNS, SWITCHING AND CIRCUITING.
5. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION PERTAINING TO HVAC AND SMOKE CONTROL DEVICES AND REQUIREMENTS.
6. G.C. TO VERIFY AND COORDINATE LOCATIONS OF ACCESS PANELS AND OTHER CEILING PENETRATING ITEMS NOT SHOWN ON THE REFLECTED CEILING PLANS.

SHEET LEGEND

- PAINTED GYPSUM BOARD
- MAGNESIACORE BOARD
- 2'X2' ACOUSTICAL CEILING TILE
- EMERGENCY EXIT LIGHT/SIGN
- WALL PACK
- 6" LED RECESSED CAN LIGHT
- 2'X4' RECESSED LIGHT
- 1'X4' SUSPENDED LIGHT FIXTURE WITH PROTECT CAGE
- 4' LED LINEAR COVE LIGHT
- 2' LED LINEAR COVE LIGHT
- LED LINEAR LIGHT
- LED HIGH BAY LUMINAIRE
- INDUSTRIAL CEILING FAN RE: ELECTRICAL DRAWINGS
- 1HR. FIRE RATED PARTITION



NORTH

1 OVERALL RCP SECOND FLOOR

SCALE: 1/16" = 1'-0"

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT ALMA K. WARREN 18378 STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.22

OVERALL RCP SECOND FLOOR

SHEET NOTES

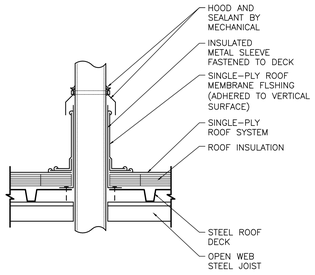
1. REFER STRUCTURAL DRAWINGS FOR TOP OF STEEL HEIGHTS.
2. PROVIDE ROOF HATCH AS SPECIFIED.
3. PROVIDE METAL END CAP WHERE PARAPET TERMINATES.
4. ROOF DRAIN AND OVERFLOW DRAIN AS SPECIFIED. REFER TO PLUMBING DRAWINGS FOR SIZE AND LEADER INFORMATION.

SHEET LEGEND

R.D. ROOF DRAIN. RE: 2/A1.31

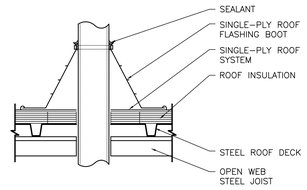
O.D. OVERFLOW DRAIN

WALKING PAD



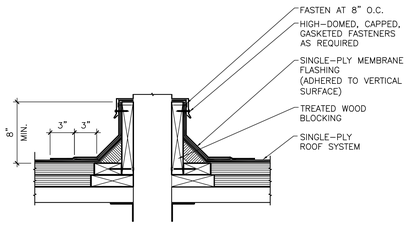
6 PIPE FLASHING (HOT) DETAIL

SCALE: 1 1/2" : 1'0" ROOF_DETL_002



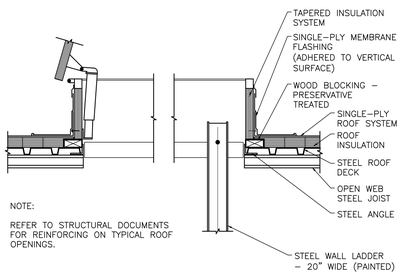
5 PIPE FLASHING (COLD) DETAIL

SCALE: 1 1/2" : 1'0" ROOF_DETL_003



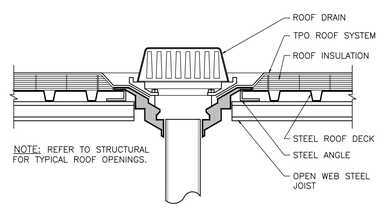
4 ROOF EQUIPMENT CURB DETAIL

SCALE: 1 1/2" : 1'0" ROOF_DETL_006



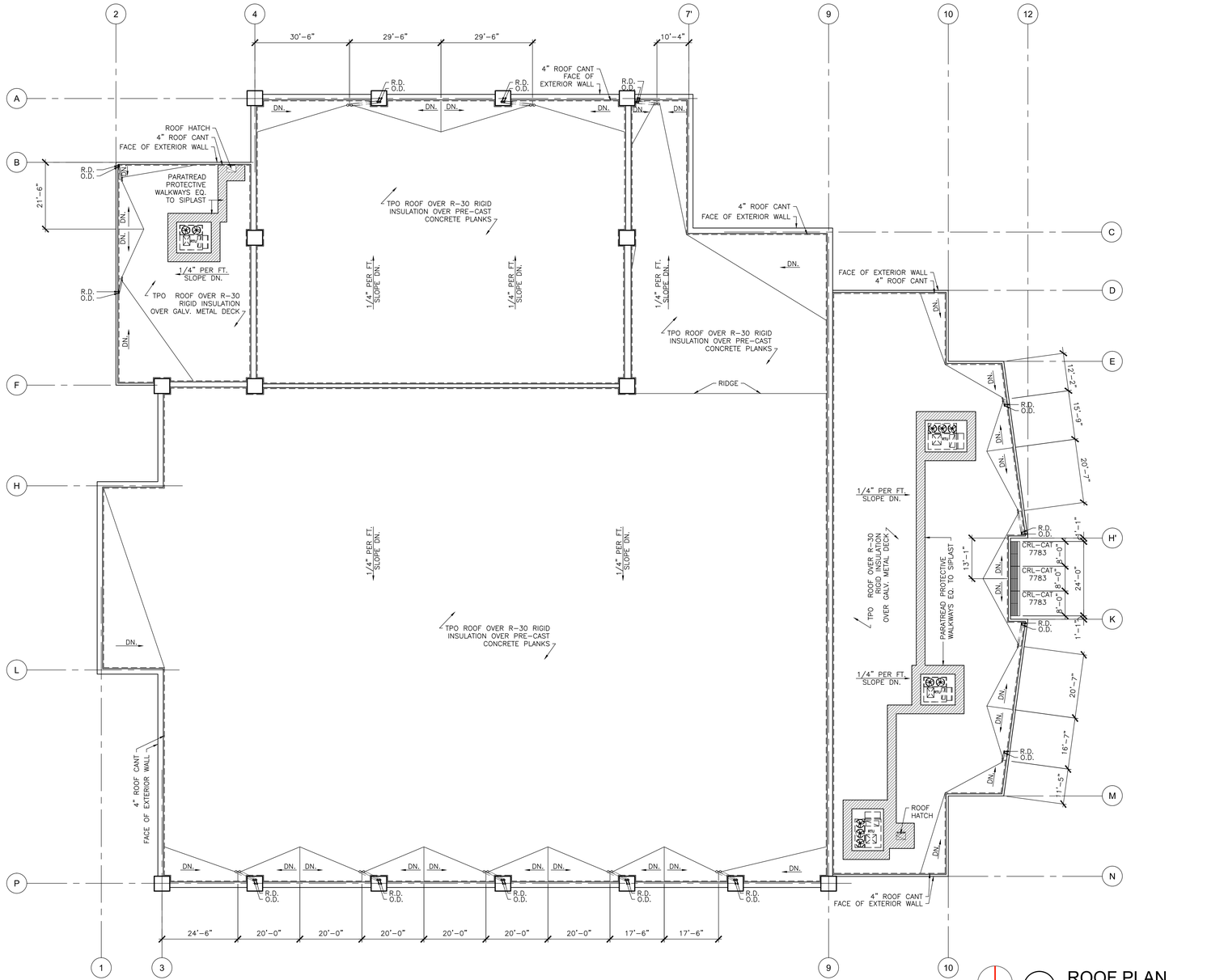
3 ROOF HATCH DETAIL

SCALE: 1 1/2" : 1'0" ROOF_DETL_004



2 ROOF DRAIN DETAIL

SCALE: 1 1/2" : 1'0" ROOF_DETL_001



1 ROOF PLAN

SCALE: 1/16" : 1'0"

NORTH

THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT 18378 STATE OF TEXAS

EXP 10-31-19

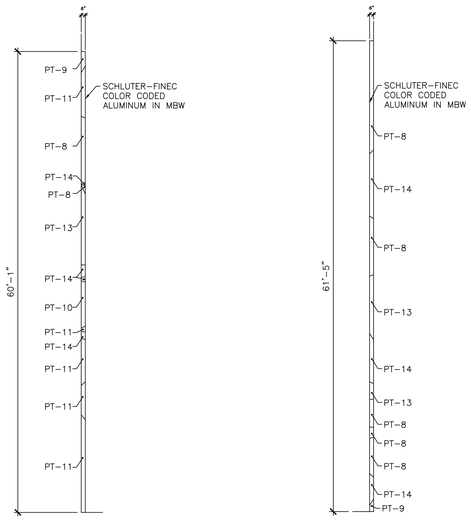
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

A1.31
ROOF PLAN

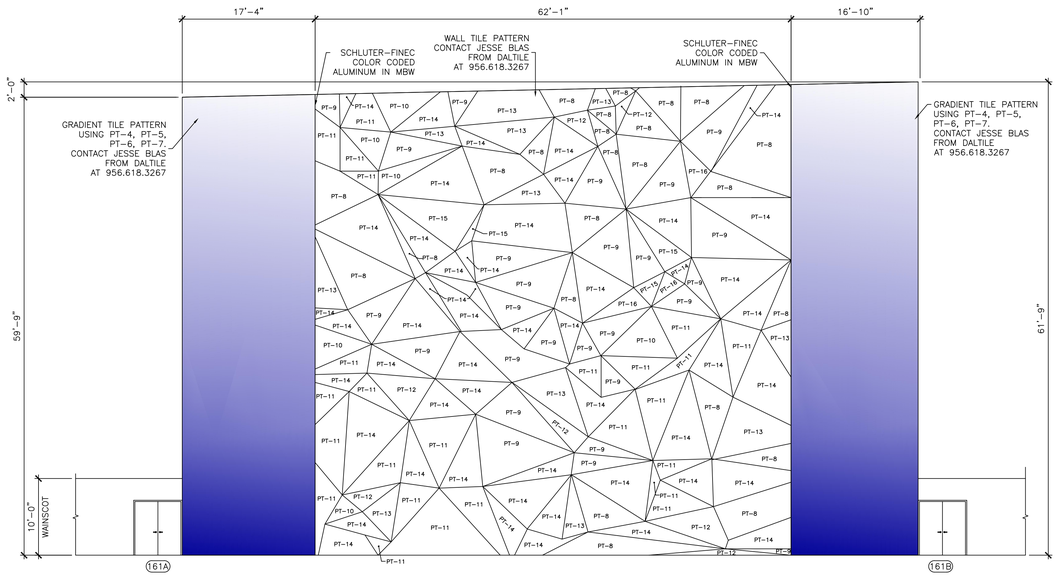


5 LEFT SIDE ELEVATION WALL TILING PATTERN 2

SCALE: 1/8" : 1'-0"

4 RIGHT SIDE ELEVATION WALL TILING PATTERN 2

SCALE: 1/8" : 1'-0"



3 ELEVATION WALL TILING PATTERN 2

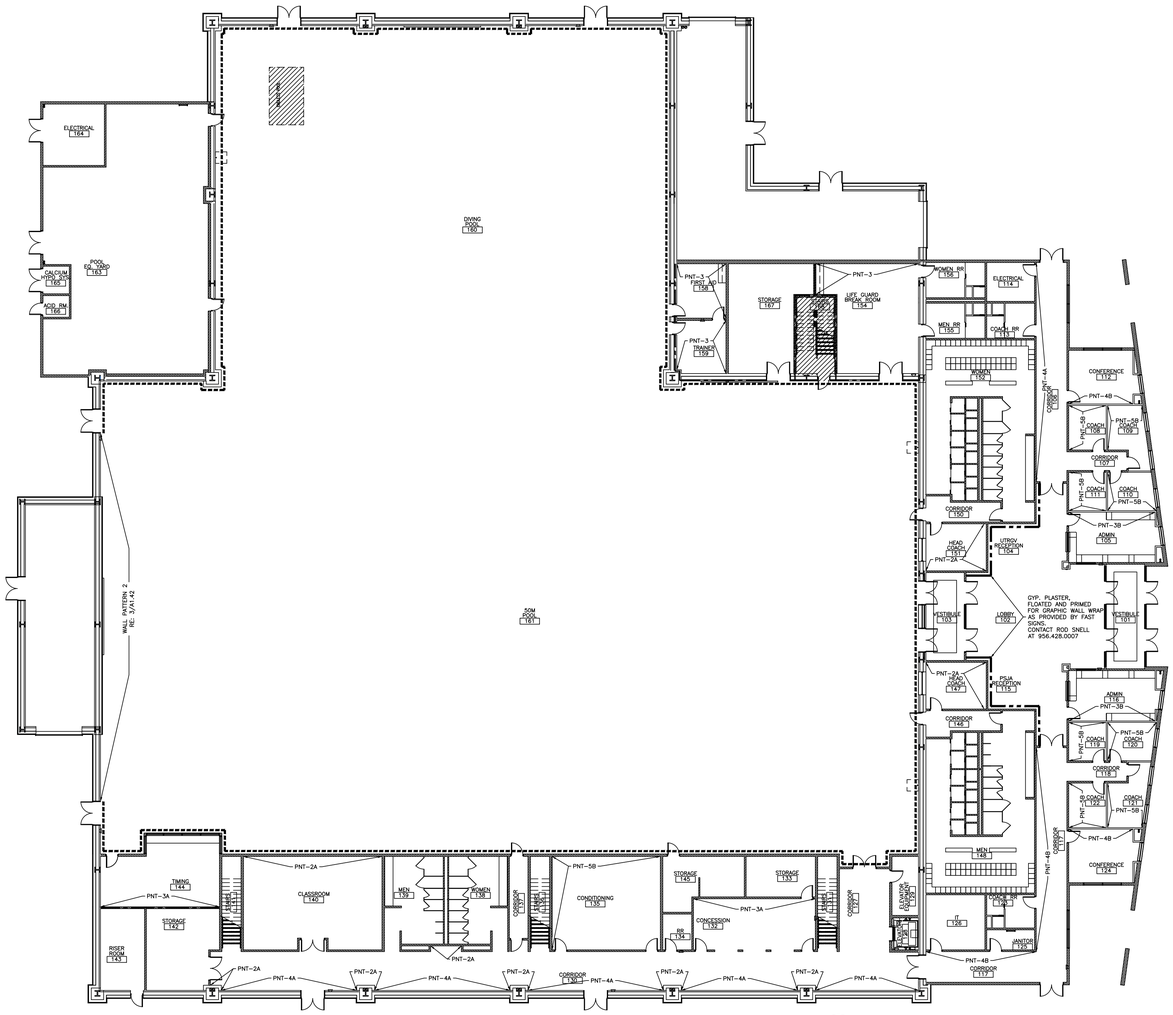
SCALE: 1/8" : 1'-0"

SHEET NOTES

1. ROOMS WITH NO ACCENT COLOR TO BE IN THE FIELD COLOR STATED BELOW.
2. FOR RESTROOM WALL TILING PATTERN, RE:12/A4.12
3. REFER SHEET A6.11 FOR ROOM FINISH SCHEDULE.

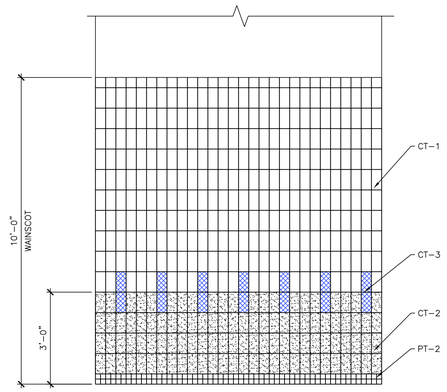
SHEET LEGEND

- WALL TILING PATTERN 1 RE: 2/A1.42
- GRAPHIC WALL WRAP AS PROVIDED BY FAST SIGNS. CONTACT ROD SNELL AT 956.428.0007



1 ACCENT WALL PLAN

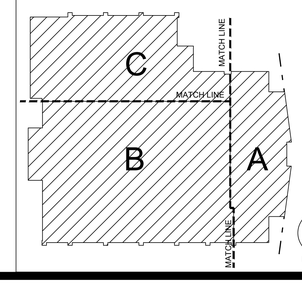
SCALE: 1/16" : 1'-0"



2 ELEVATION WALL TILING PATTERN 1

SCALE: 3/8" : 1'-0"

KEY PLAN



NORTH

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

SEAL

REGISTERED ARCHITECT
JOHN M. WARREN
18378
STATE OF TEXAS

EXP 10-31-19

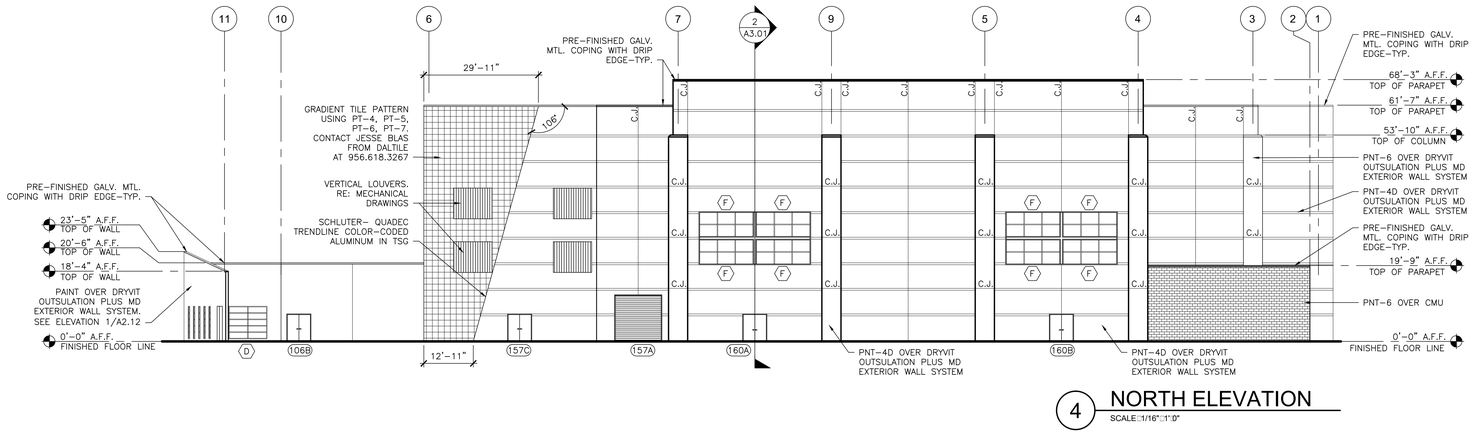
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

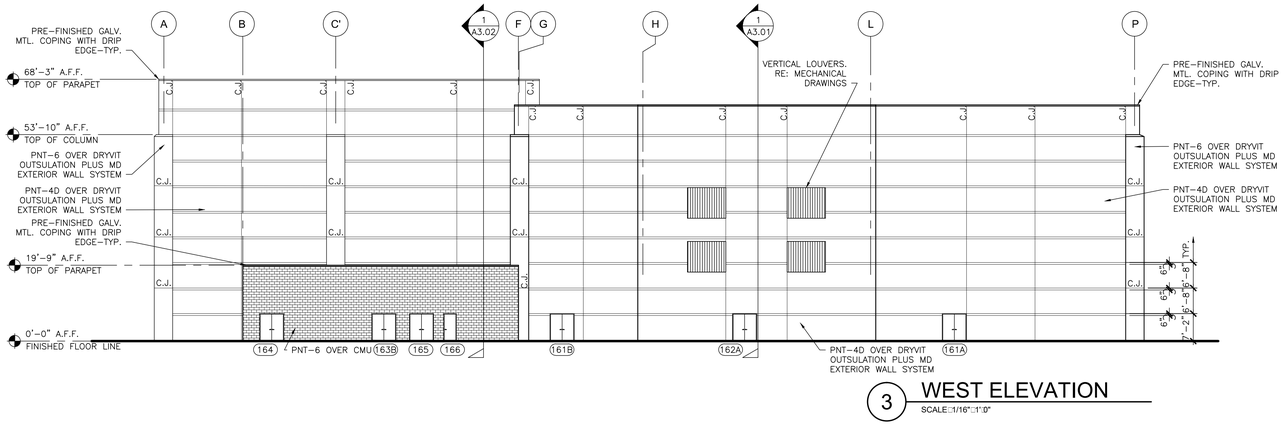
3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

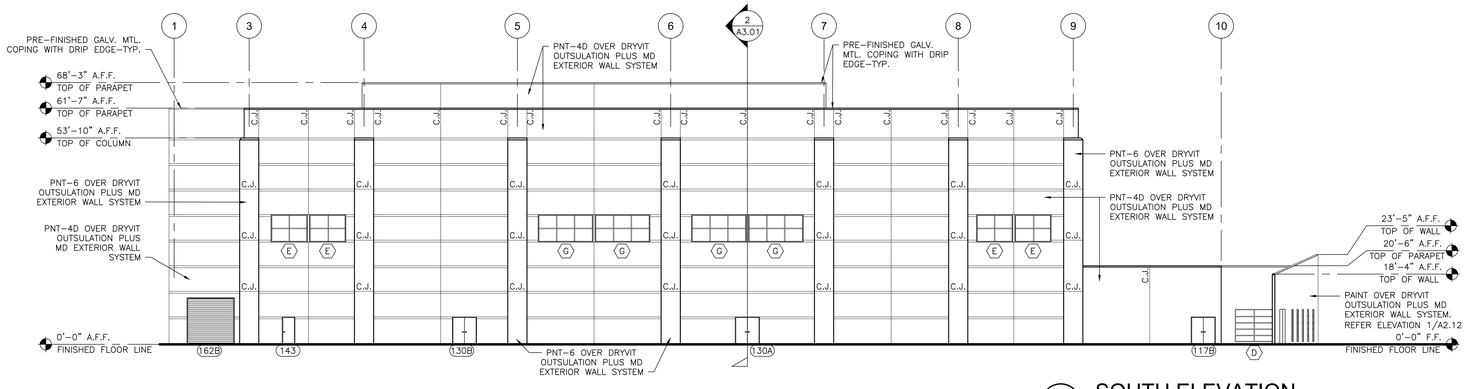
A1.42
ACCENT WALL PLAN



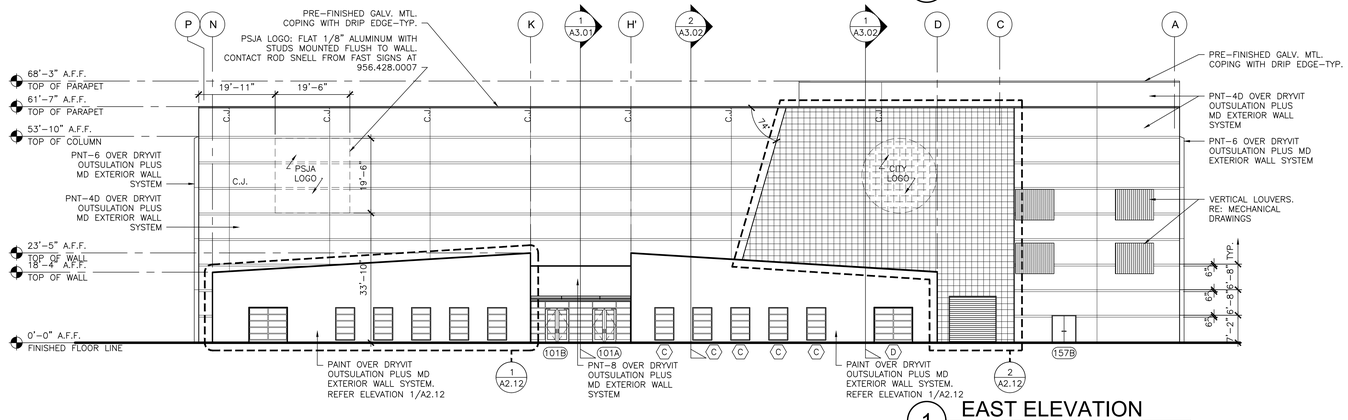
4 NORTH ELEVATION
SCALE: 1/16" = 1'-0"



3 WEST ELEVATION
SCALE: 1/16" = 1'-0"



2 SOUTH ELEVATION
SCALE: 1/16" = 1'-0"



1 EAST ELEVATION
SCALE: 1/16" = 1'-0"

SHEET NOTES

1. REFER TO SHEET A6.21 FOR DOOR AND WINDOW SCHEDULE.
2. REFER TO SHEET A6.22 FOR DOOR AND WINDOW ELEVATIONS.
3. REFER TO SHEET A6.11 FOR FINISH SCHEDULE.

SHEET LEGEND

CMU BLOCK

PORCELAIN TILE

C.J. CONTROL "V" JOINTS REFER TO 2/A5.11

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18378
STATE OF TEXAS

EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

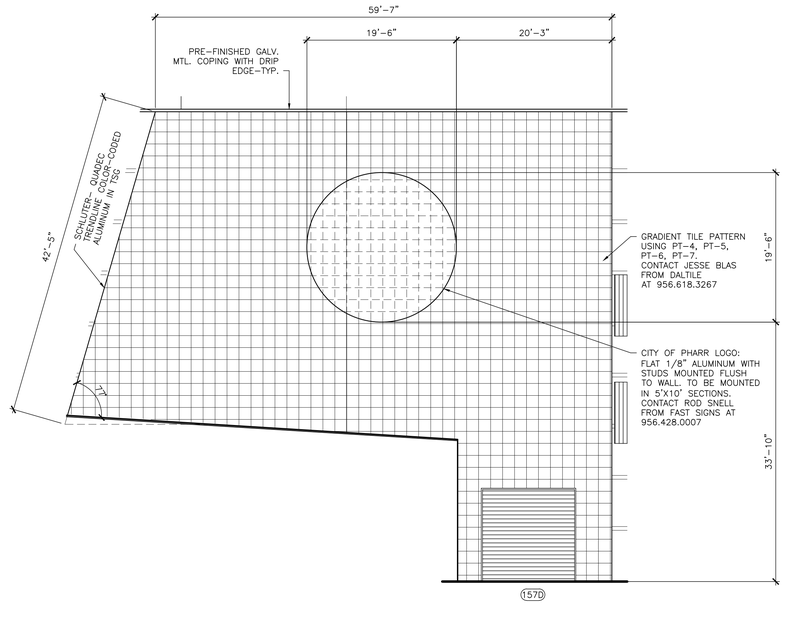
3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

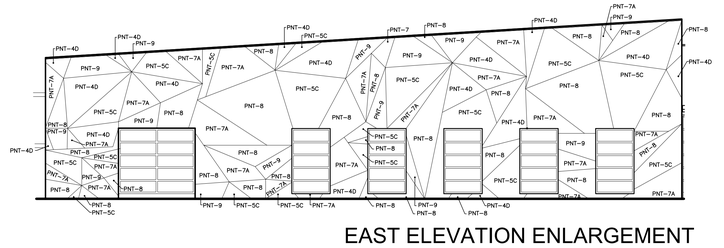
A2.11
EXTERIOR ELEVATIONS

SHEET NOTES

1. REFER TO SHEET A6.21 FOR DOOR AND WINDOW SCHEDULE.
2. REFER TO SHEET A6.22 FOR DOOR AND WINDOW ELEVATIONS.
3. REFER TO SHEET A6.11 FOR FINISH SCHEDULE.



2 EAST ELEVATION ENLARGEMENT
SCALE: 1/8"=1'0"



1 EAST ELEVATION ENLARGEMENT WALL PAINT PATTERN
SCALE: 1/8"=1'0"

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
CARLOS M. WARREN
18378
STATE OF TEXAS

EXP 10-31-19

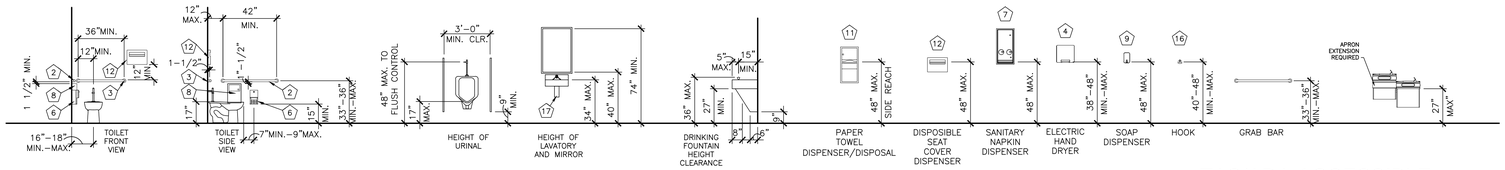
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

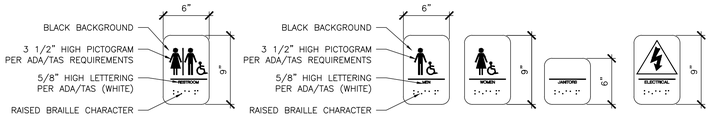
PROJECT	971805
DATE	06/07/2019
REVISED	

A2.12
PARTIAL ENLARGED EXTERIOR ELEVATIONS



TAS/ADA ACCESSIBLE MOUNTING HEIGHT

16 SCALE:□3/4"=□1'0"

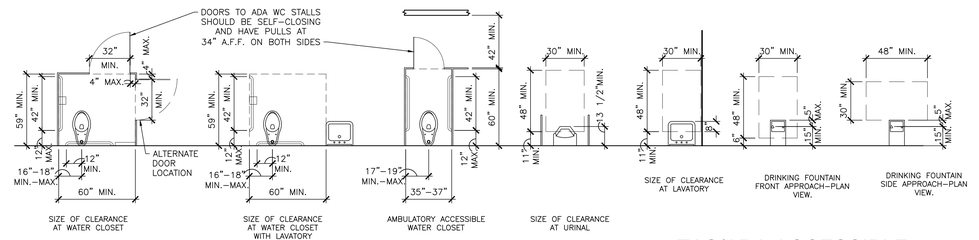


NOTES:

1. GENERAL CONTRACTOR TO COMPLY WITH ALL APPLICABLE ADA/TAS REQUIREMENTS.

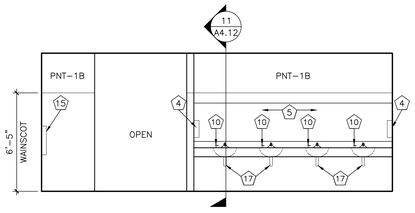
TAS/ADA ACCESSIBLE SIGNAGE SCHEDULE

15 SCALE:□1 1/2"=□1'0"



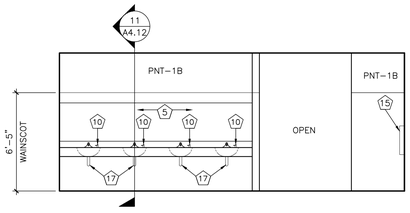
TAS/ADA ACCESSIBLE FIXTURE CLEARANCE

14 SCALE:□1/4"=□1'0"



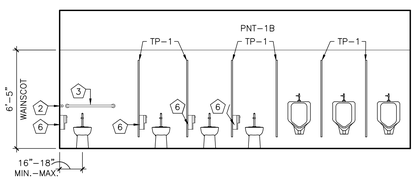
ELEVATION MEN 139

13 SCALE:□1/4"=□1'0"



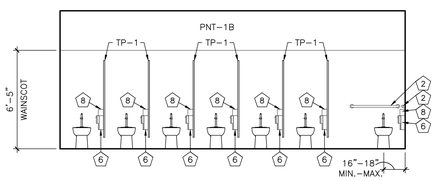
ELEVATION WOMEN 138

12 SCALE:□1/4"=□1'0"



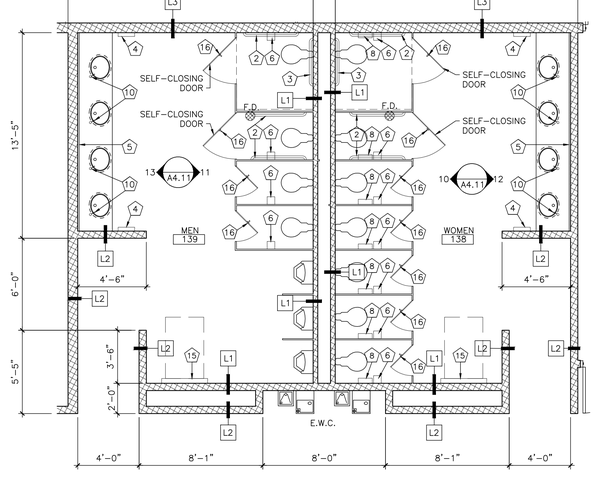
ELEVATION MEN 139

11 SCALE:□1/4"=□1'0"



ELEVATION WOMEN 138

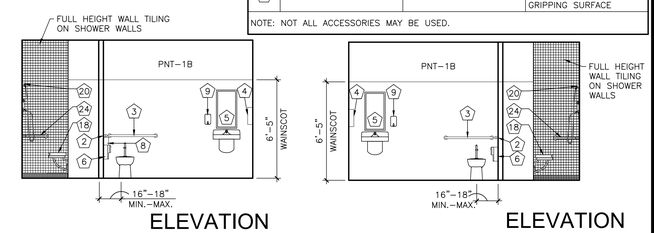
10 SCALE:□1/4"=□1'0"



NORTH

ENLARGED PLAN WOMEN 138 & MEN 139

9 SCALE:□1/4"=□1'0"

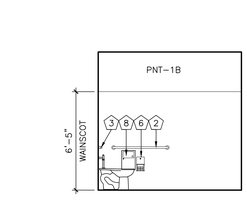


ELEVATION WOMEN 156

8 SCALE:□1/4"=□1'0"

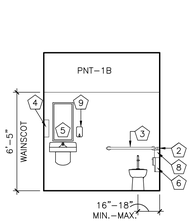
ELEVATION MEN 155

7 SCALE:□1/4"=□1'0"



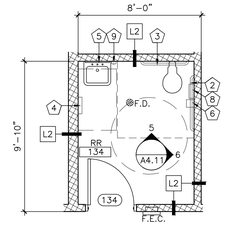
ELEVATION RR 134

6 SCALE:□1/4"=□1'0"



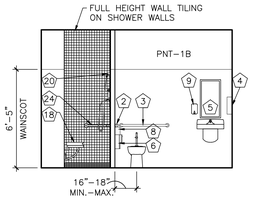
ELEVATION RR 134

5 SCALE:□1/4"=□1'0"



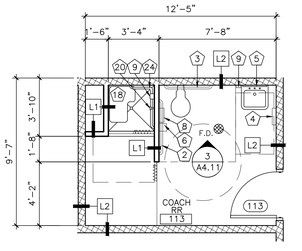
ENLARGED PLAN RR 134

4 SCALE:□1/4"=□1'0"



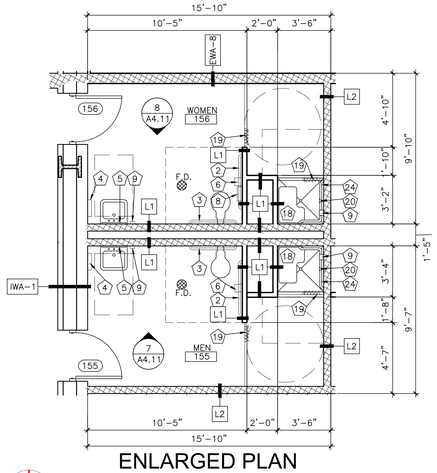
ELEVATION COACH RR 113 & 123

3 SCALE:□1/4"=□1'0"



ENLARGED PLAN COACH RR 113 & 123

2 SCALE:□1/4"=□1'0"



NORTH

ENLARGED PLAN MEN 155 & WOMEN 156

1 SCALE:□1/4"=□1'0"

ACCESSORY SCHEDULE

KEY	ITEM	ADULT	
		STANDARD	HANDICAP (HC)
–	WATER CLOSET (WC)	15" TO TOP OF SEAT	17" TO TOP OF SEAT
–	URINAL (UR)	24" TO TOP OF RIM	17" TO TOP OF RIM
–	LAVATORY (LAV)	34 TO TOP	27" TO BOTTOM OF APRON
1	GRAB BAR (48")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
2	GRAB BAR (42")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
3	GRAB BAR (36")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
4	ELECTRIC HAND DRYER	48" TO CONTROL	38" TO CONTROL
5	FRAMED WALL MOUNTED MIRROR	74" TO TOP	40" TO BOTTOM OF REFLECTIVE SURFACE
6	TISSUE DISPENSER	15" TO CONTROL DEVICE	15" TO CONTROL DEVICE
7	SANITARY NAPKIN DISPENSER	48" TO CONTROL DEVICE	48" TO CONTROL DEVICE
8	SANITARY NAPKIN DISPOSAL	19" TO CONTROL DEVICE	19" TO CONTROL DEVICE
9	WALL MOUNTED RECESSED SOAP DISPENSER	48" TO CONTROL DEVICE	48" TO CONTROL DEVICE
10	COUNTER MOUNTED SOAP DISPENSER	AT COUNTER	AT COUNTER – 34" MAX.
11	PAPER TOWEL DISPENSER/DISPOSAL	48" TO CONTROL DEVICE	48" TO CONTROL DEVICE
12	DISPOSIBLE SEAT COVER DISPENSER	48" TO CONTROL DEVICE	48" TO CONTROL DEVICE
13	MOP–HOOK	48" TO CONTROL DEVICE	48" TO CONTROL DEVICE
14	ACCESSIBLE SIGNAGE	60" TO CENTER OF SIGN	60" TO CENTER OF SIGN
15	DIAPER CHANGING STATION	27" TO UNDER OF UNFOLDED SURFACE	–
16	CLOTHES/TOWEL HOOK	–	48" MAXIMUM TO CENTER
17	FOAM PIPE INSULATION WRAPPING	ALL EXPOSED LAVATORY PIPING	
18	SHOWER COMPARTMENT SEAT	–	17" MIN 19" MAX TO TOP OF UNFOLDED SURFACE
19	SHOWER CURTAIN AND ROD	76 1/2" TO CENTER OF BAR FOR 72" CURTAIN	–
20	SHOWER HEAD	SHOWER HEAD	48"WITH HOSE RE: MEP DWG'S
21	GRAB BAR (18")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
22	GRAB BAR (24")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
23	GRAB BAR (60")	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE
24	TWO–WALL GRAB BAR	–	33" MIN./36" MAX. TO THE TOP OF THE GRIPPING SURFACE

NOTE: NOT ALL ACCESSORIES MAY BE USED.

SHEET NOTES

1. GENERAL CONTRACTOR TO COMPLY WITH ALL TAS AND ADA APPLICABLE CODES AND REGULATIONS.
2. GENERAL CONTRACTOR TO COORDINATE WITH OWNER FOR ALL ACCESSORY PLACEMENTS AND TO INSTALL THEM PER TAS AND ADA ACCESSIBLE MOUNTING AND ACCESSORY SCHEDULE HEIGHTS.
3. ALL TOILET PARTITIONS TO BE FLOOR ANCHORED.
4. URINAL PARTITIONS TO BE WALL MOUNTED.
5. FOR WALL TILING PATTERN RE:12/A4.12.

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT 18378 STATE OF TEXAS

EXP 10–31–19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

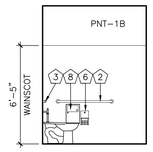
3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

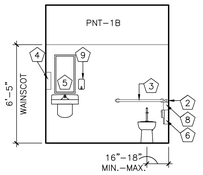
A4.11
ENLARGED FLOOR PLANS

SHEET NOTES

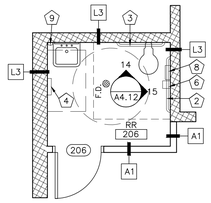
1. GENERAL CONTRACTOR TO COMPLY WITH ALL TAS AND ADA APPLICABLE CODES AND REGULATIONS.
2. GENERAL CONTRACTOR TO COORDINATE WITH OWNER FOR ALL ACCESSORY PLACEMENTS AND TO INSTALL THEM PER TAS AND ADA ACCESSIBLE MOUNTING AND ACCESSORY SCHEDULE HEIGHTS.
3. ALL TOILET PARTITIONS TO BE FLOOR ANCHORED.
4. URINAL PARTITIONS TO BE WALL MOUNTED.
5. FOR WALL TILING PATTERN RE:12/A4.12.



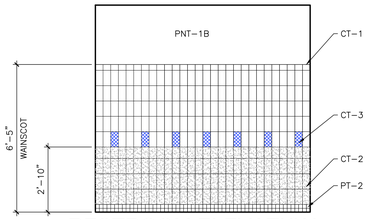
15 ALTERNATE 1 ELEVATION RR 206
SCALE: 1/4" = 1'-0"



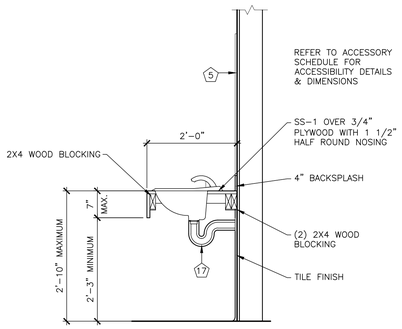
14 ALTERNATE 1 ELEVATION RR 206
SCALE: 1/4" = 1'-0"



13 ALTERNATE 1 ENLARGED PLAN RR 206
SCALE: 1/4" = 1'-0"

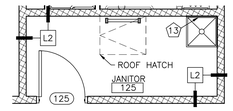


12 RESTROOM ELEVATION WALL TILING PATTERN TYP.
SCALE: 1/4" = 1'-0"

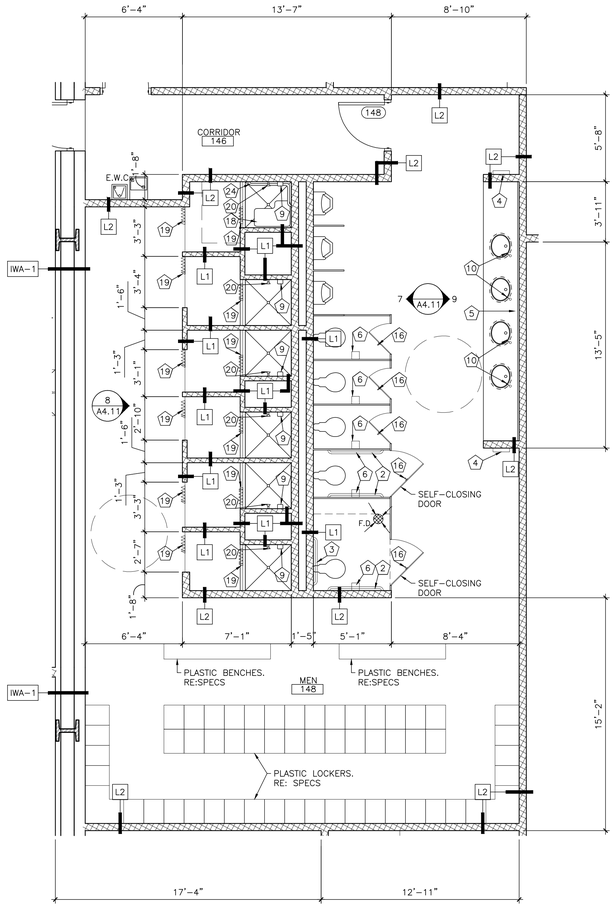


11 LAVATORY COUNTER SECTION
SCALE: 3/4" = 1'-0"

MWRK_SECT_005

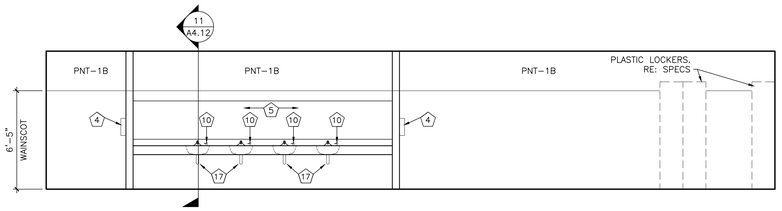


10 ENLARGED PLAN JANITOR 125
SCALE: 1/4" = 1'-0"

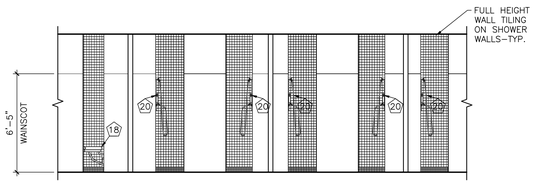


NORTH

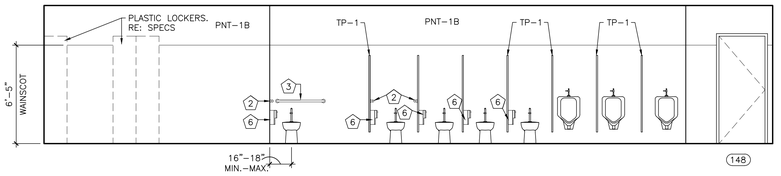
6 ENLARGED PLAN MEN 148 & CHANGING RM 149
SCALE: 1/4" = 1'-0"



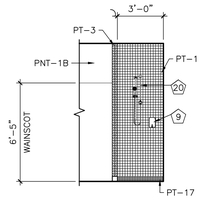
9 ELEVATION MEN 148
SCALE: 1/4" = 1'-0"



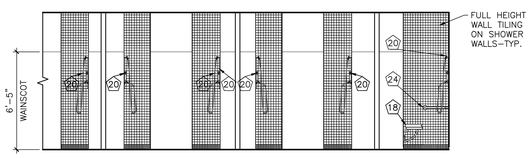
8 ELEVATION MEN 148
SCALE: 1/4" = 1'-0"



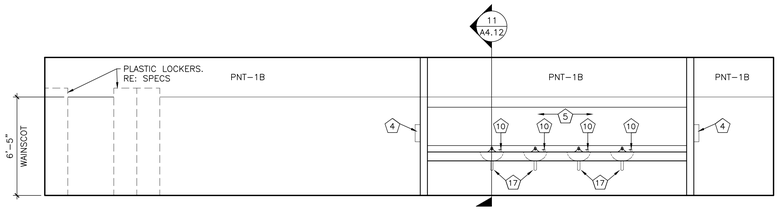
7 ELEVATION MEN 148
SCALE: 1/4" = 1'-0"



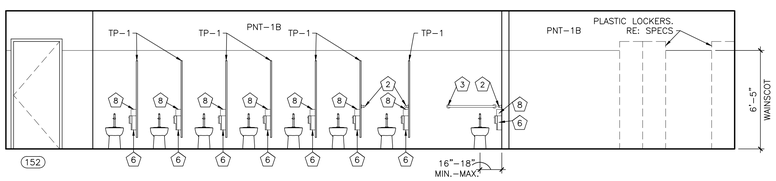
5 TYPICAL ELEVATION SHOWER AREA
SCALE: 1/4" = 1'-0"



4 ELEVATION WOMEN 152
SCALE: 1/4" = 1'-0"



3 ELEVATION WOMEN 152
SCALE: 1/4" = 1'-0"



2 ELEVATION WOMEN 152
SCALE: 1/4" = 1'-0"

NORTH

1 ENLARGED PLAN WOMEN 152 & CHANGING RM 153
SCALE: 1/4" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

SEAL
REGISTERED ARCHITECT
18378
STATE OF TEXAS
EXP 10-31-19

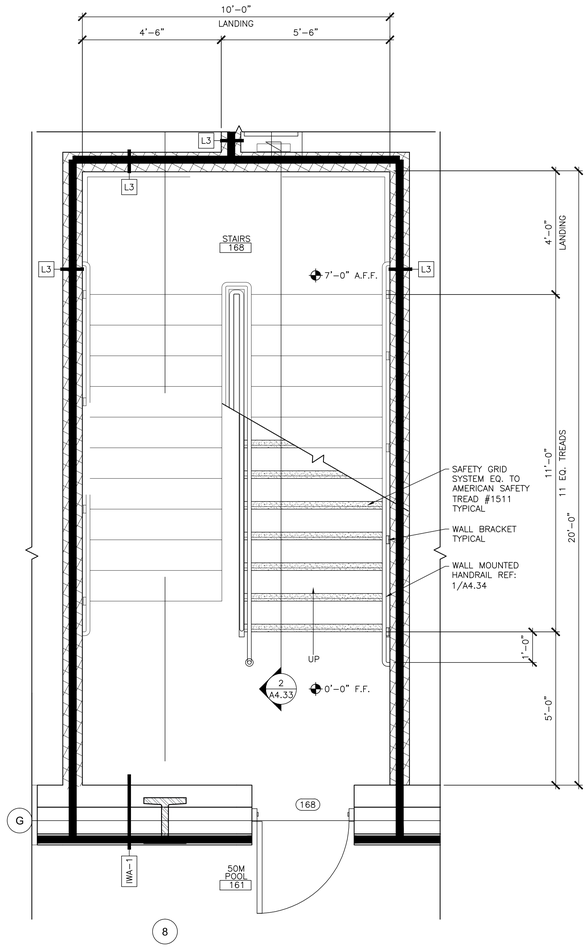
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

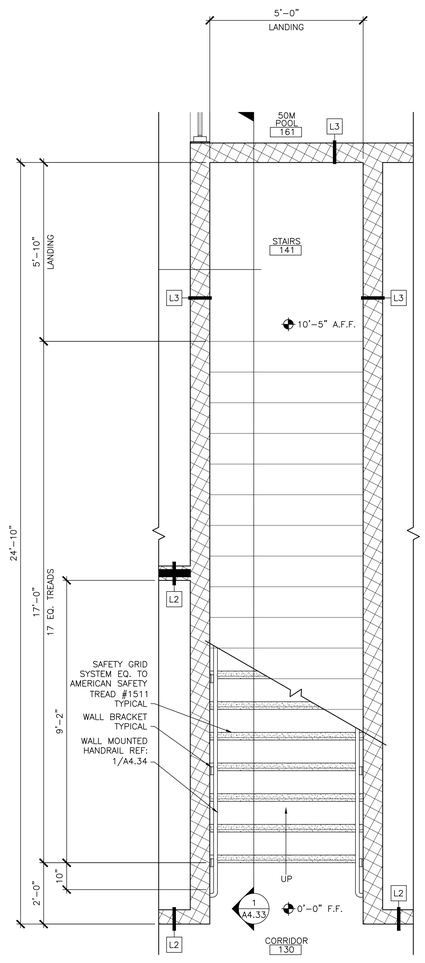
A4.12
ENLARGED FLOOR PLANS



NORTH

4 ALT.# STAIR 168 AT FIRST FLOOR PLAN

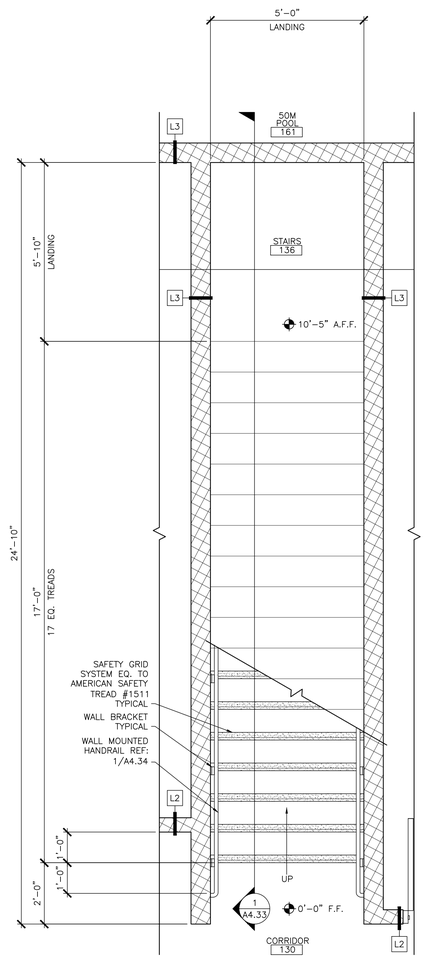
SCALE:1/2"=1'-0"



NORTH

3 STAIR 141 AT FIRST FLOOR PLAN

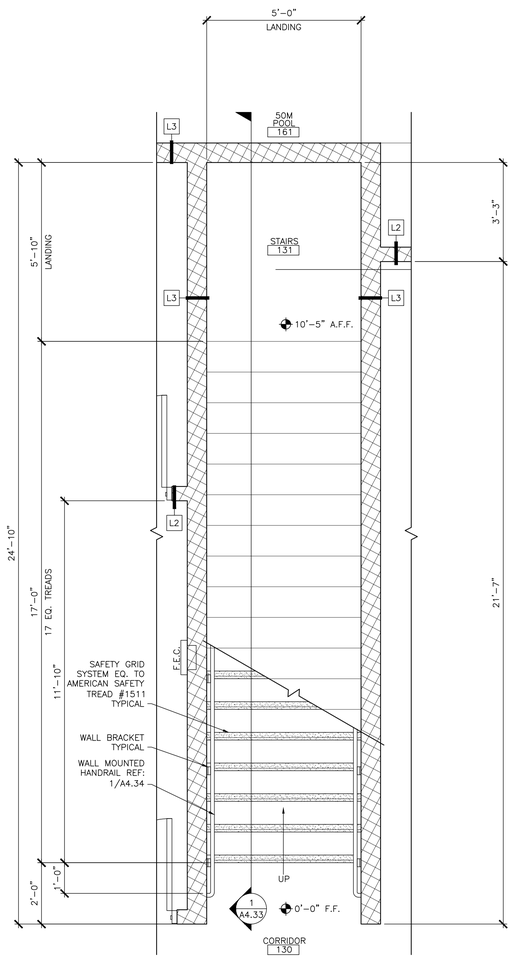
SCALE:1/2"=1'-0"



NORTH

2 STAIR 136 AT FIRST FLOOR PLAN

SCALE:1/2"=1'-0"



NORTH

1 STAIR 131 AT FIRST FLOOR PLAN

SCALE:1/2"=1'-0"

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18375
STATE OF TEXAS

EXP 10-31-19

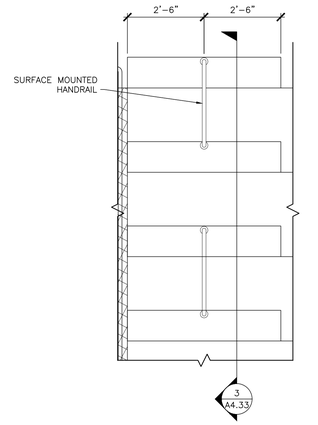
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

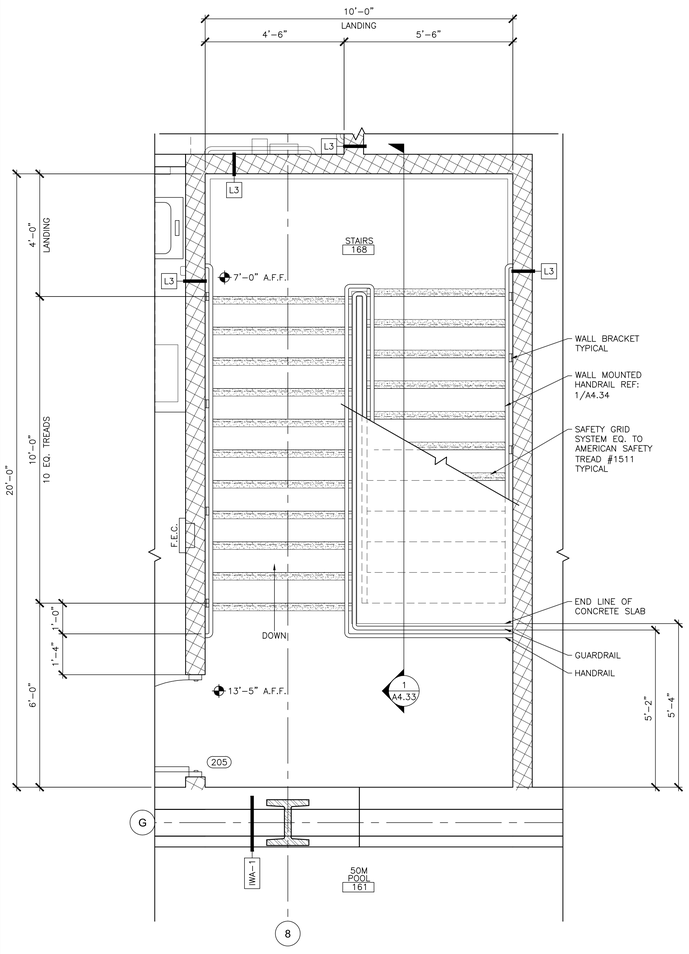
A4.31
ENLARGED
STAIRWAY PLANS



NORTH

5 SEATING HANDRAIL SECOND FLOOR PLAN

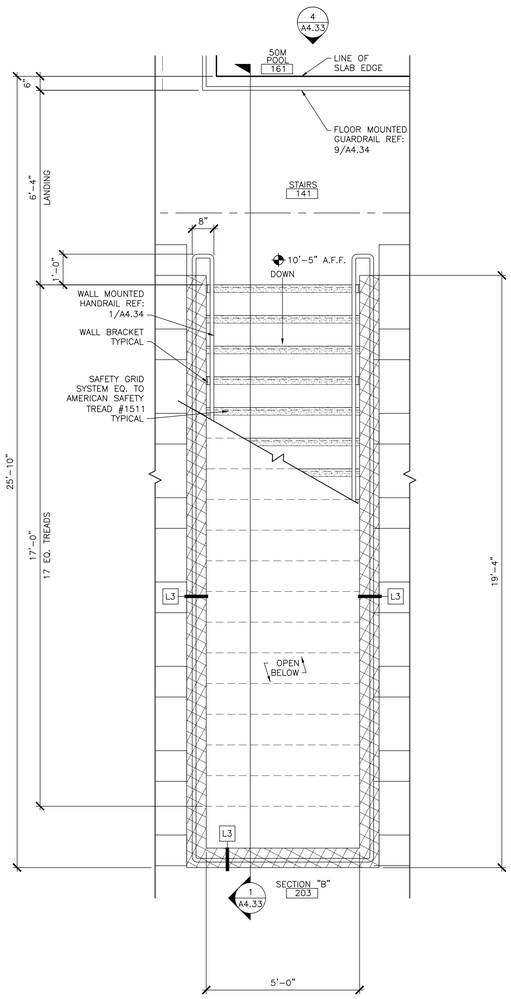
SCALE:3/2":1'0"



NORTH

4 ALT.#1 STAIR 168 AT SECOND FLOOR PLAN

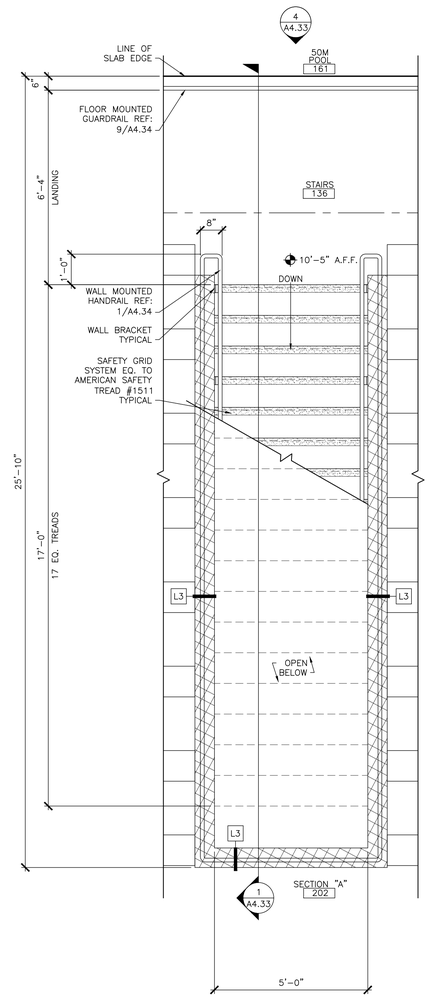
SCALE:1/2":1'0"



NORTH

3 STAIR 141 AT SECOND FLOOR PLAN

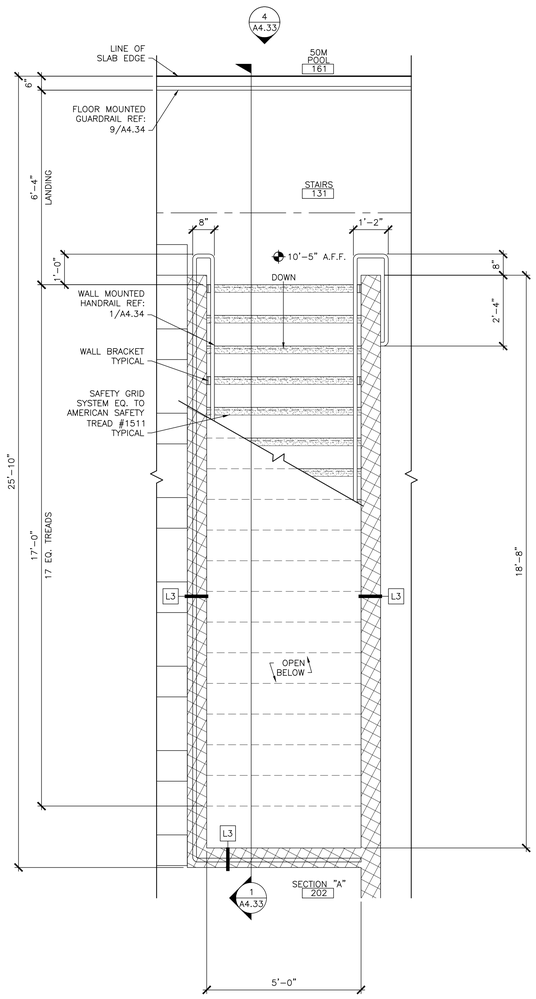
SCALE:1/2":1'0"



NORTH

2 STAIR 136 AT SECOND FLOOR PLAN

SCALE:1/2":1'0"



NORTH

1 STAIR 131 AT SECOND FLOOR PLAN

SCALE:1/2":1'0"

TWG
THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
JOHN M. WARREN
18375
STATE OF TEXAS

EXP 10-31-19

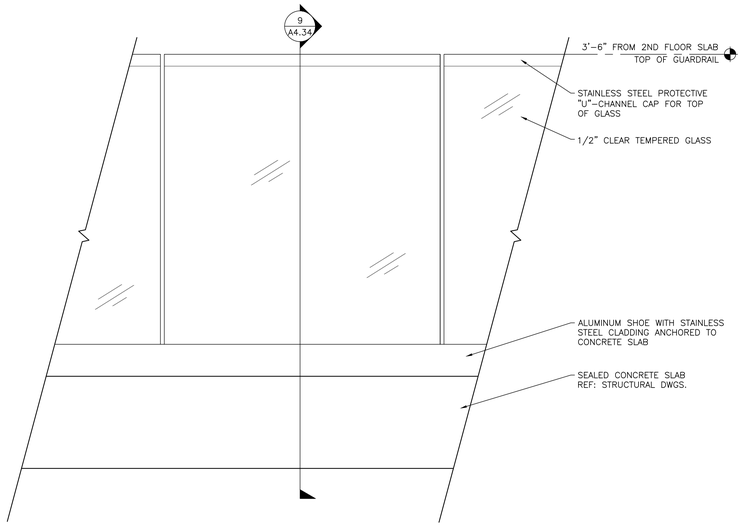
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

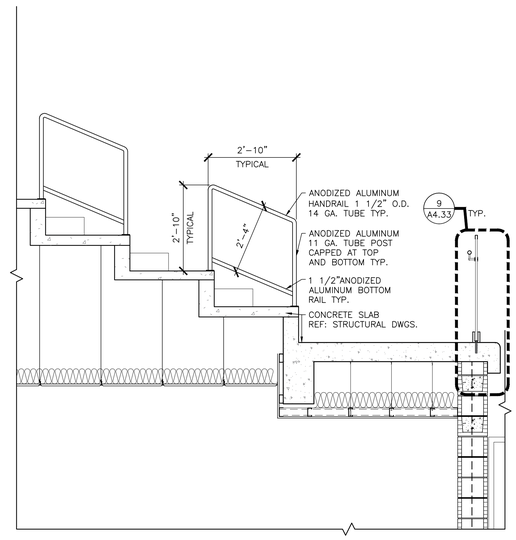
PROJECT	971805
DATE	06/07/2019
REVISED	

A4.32
ENLARGED STAIRWAY PLANS



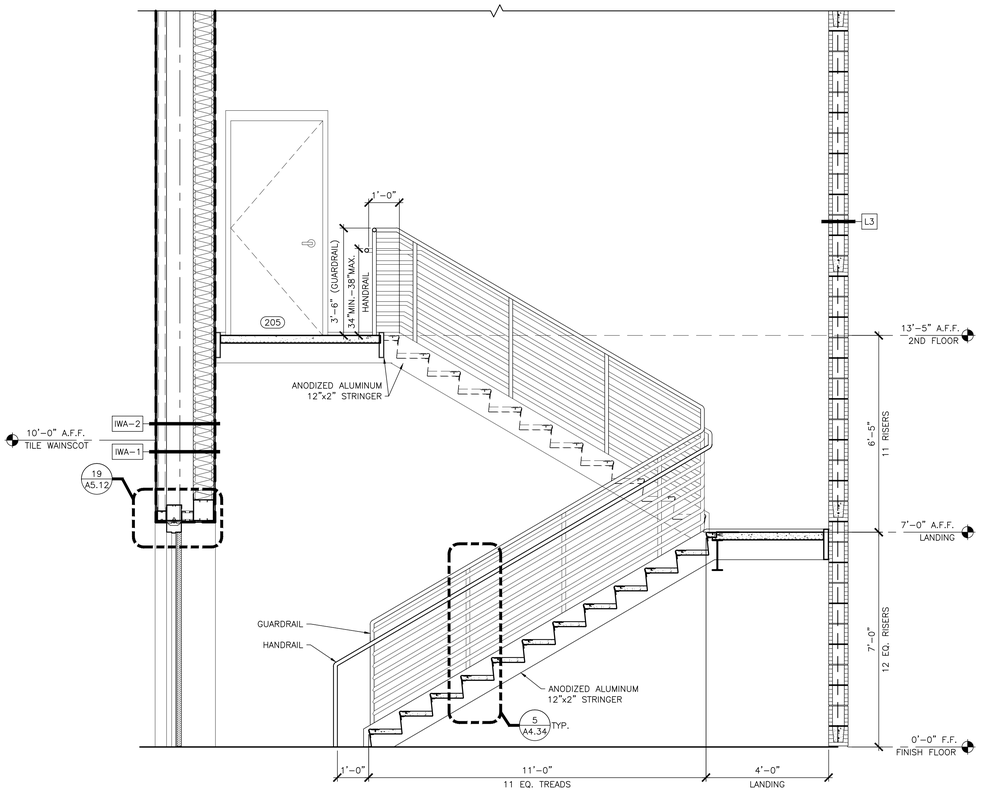
4 GLASS RAILING PARTIAL ELEVATION

SCALE:1/2"=1'0"



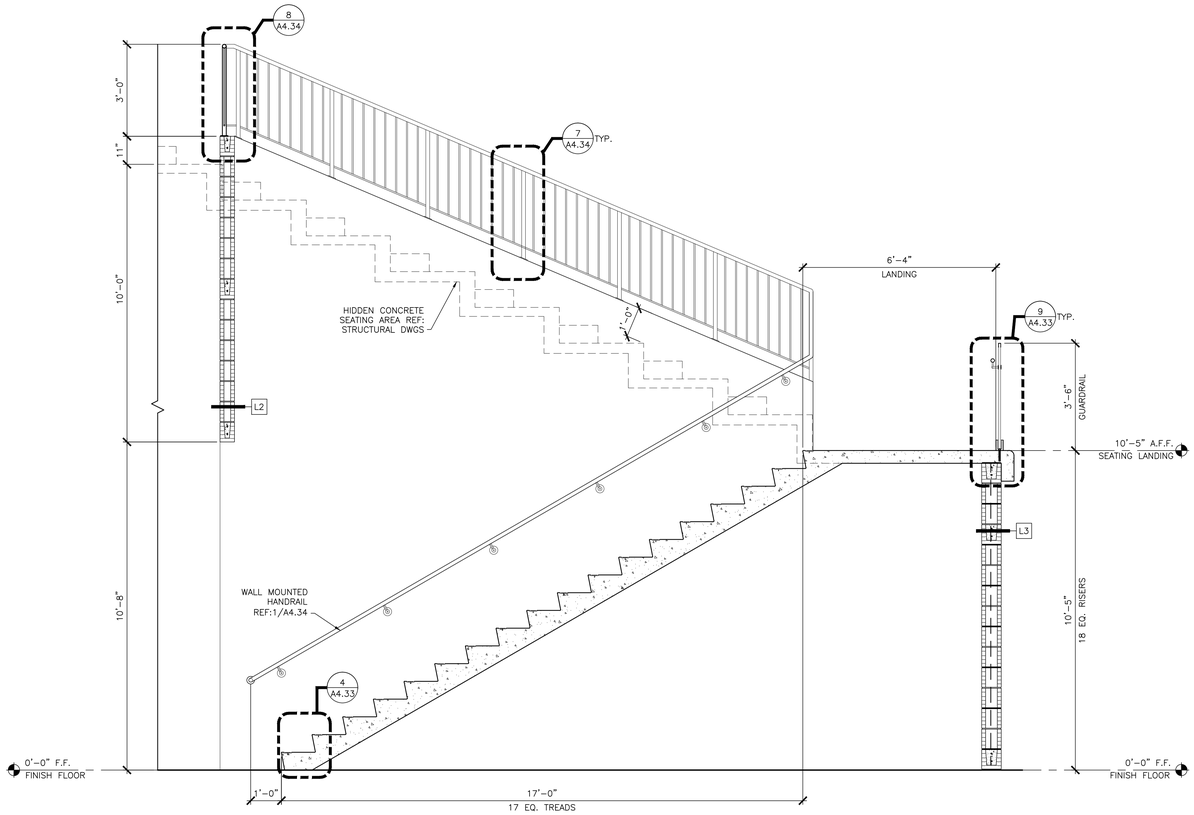
3 SEATING HARDRAIL

SCALE:1/2"=1'0"



2 STAIR 168 SECTION

SCALE:1/2"=1'0"



1 STAIR 131, 136, & 141 SECTION

SCALE:1/2"=1'0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
18378
STATE OF TEXAS

EXP 10-31-19

PROPOSED

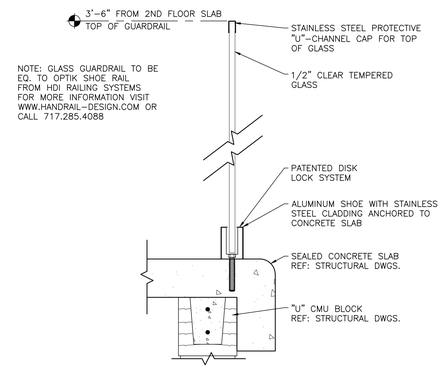
CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

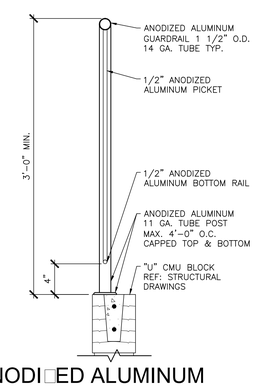
A4.33

STAIRWAY SECTIONS



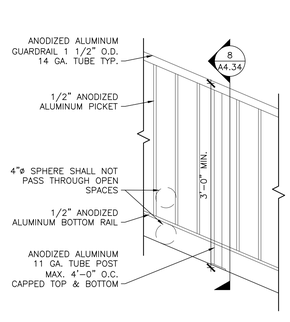
9 GLASS GUARDRAIL DETAIL

SCALE: 1 1/2" = 1'0" STRS_DETL_009



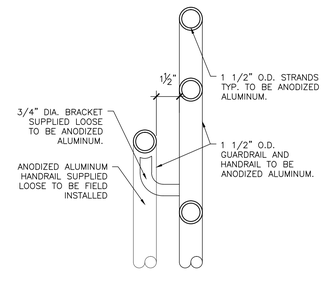
8 ANODIZED ALUMINUM GUARDRAIL DETAIL

SCALE: 1 1/2" = 1'0" STRS_DETL_008



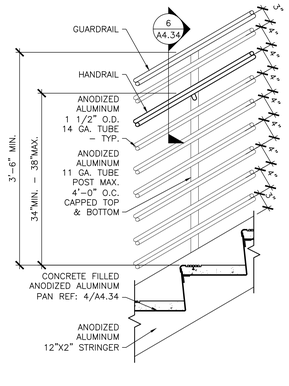
7 STAIR RAIL DETAIL STAIRS 131, 136, 141

SCALE: 1" = 1'0" STRS_DETL_007



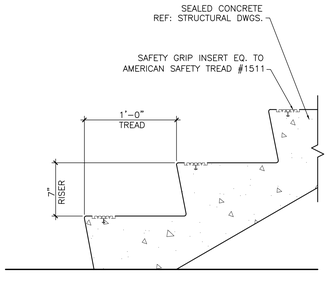
6 STAIR GUARDRAIL WITH HANDRAIL DETAIL

SCALE: 3" = 1'0" STRS_DETL_002



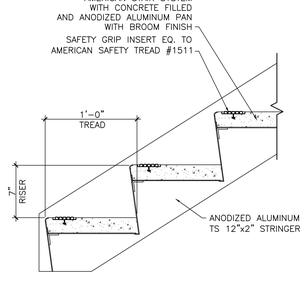
5 STAIR RAIL DETAIL STAIR 168

SCALE: 1" = 1'0" STRS_DETL_001



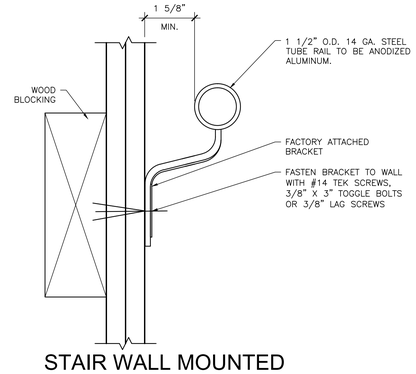
4 STAIR ASSEMBLY DETAIL 131,136,141

SCALE: 1 1/2" = 1'0" STRS_DETL_006



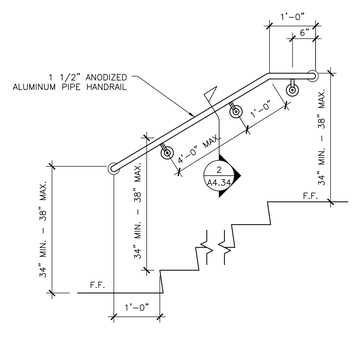
3 STAIR ASSEMBLY DETAIL STAIRS 168

SCALE: 1 1/2" = 1'0" STRS_DETL_005



2 STAIR WALL MOUNTED HANDRAIL DETAIL

SCALE: 6" = 1'0" STRS_DETL_004



1 TYPICAL WALL MOUNTED STAIR RAIL ELEVATION

SCALE: 3/4" = 1'0" STRS_DETL_003

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

EXP 10-31-19

PROPOSED

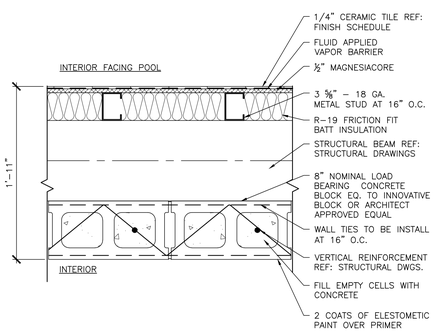
CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

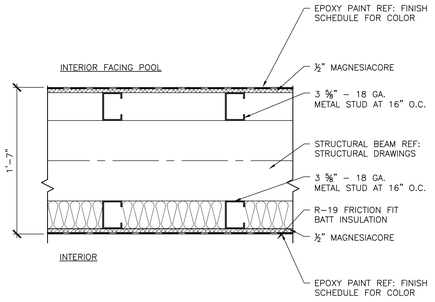
A4.34

STAIRWAY DETAILS



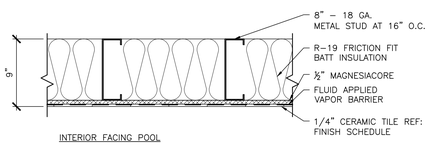
IWA-6 TILE OVER MTL. STUD OVER STRL. MEMBER OVER 8" CMU

SCALE: 1 1/2": 1'0" EWA-6.DWG



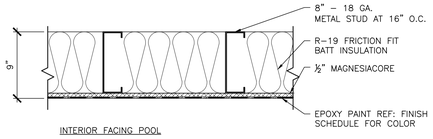
IWA-5 DRYVIT OVER 3 5/8" MTL. STUD OVER STRL. BEAM OVER 3 5/8"

SCALE: 1 1/2": 1'0" IWA-5.DWG



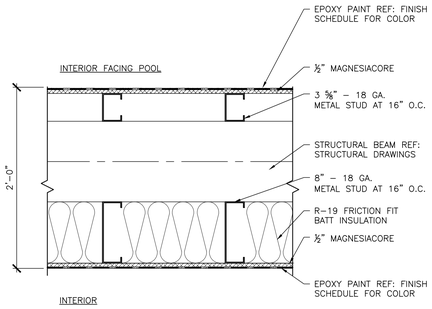
IWA-4 TILE OVER MAGNESIACORE OVER MTL. STUD

SCALE: 1 1/2": 1'0" EWA-4.DWG



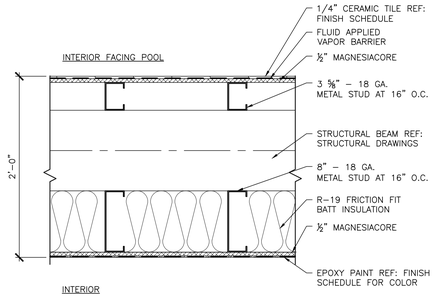
IWA-3 EPOXY OVER MAGNESIACORE OVER MTL. STUD

SCALE: 1 1/2": 1'0" EWA-3.DWG



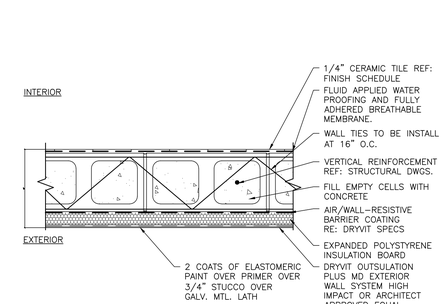
IWA-2 DRYVIT OVER 8" MTL. STUD OVER STRL. MEMBER OVER MTL.

SCALE: 1 1/2": 1'0" EWA-2.DWG



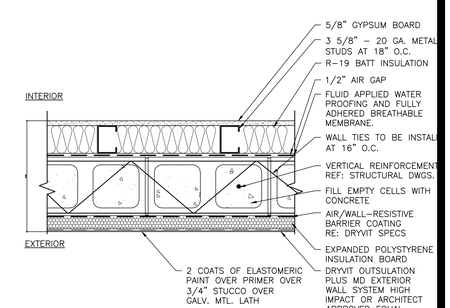
IWA-1 DRYVIT OVER 8" MTL. STUD OVER STRL. MEMBER W/ TILE

SCALE: 1 1/2": 1'0" IWA-1.DWG



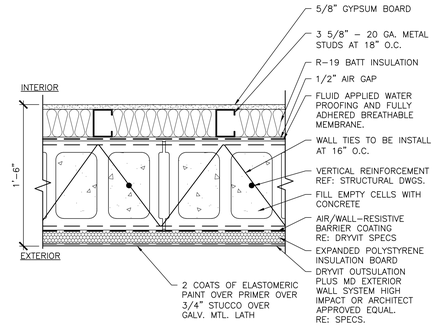
EWA-8 DRYVIT OVER 8" CMU W/ TILE

SCALE: 1 1/2": 1'0" EWA-8.DWG



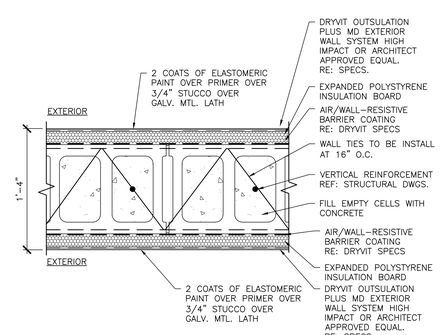
EWA-7 DRYVIT OVER 8" CMU OVER MTL. STUD

SCALE: 1 1/2": 1'0" EWA-7.DWG



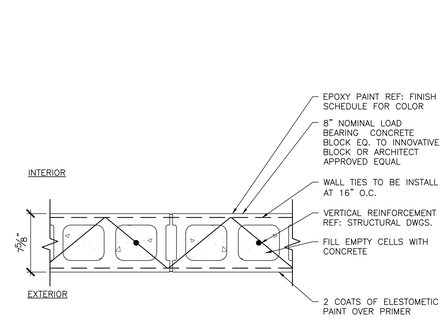
EWA-6 DRIVIT OVER 12" CMU OVER MTL. STUD

SCALE: 1 1/2": 1'0" EWA-6.DWG



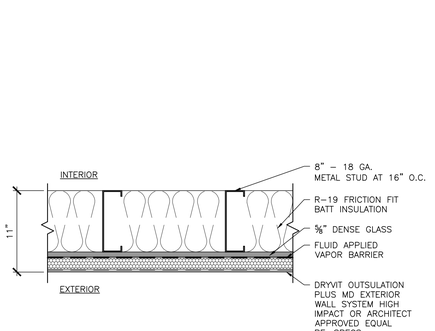
EWA-5 DRYVIT OVER 12" CMU OVER DRYVIT

SCALE: 1 1/2": 1'0" EWA-5.DWG



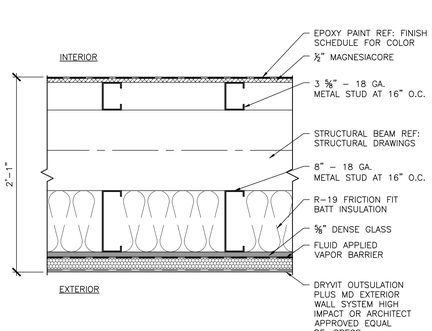
EWA-4 8" CMU

SCALE: 1 1/2": 1'0" EWA-4.DWG



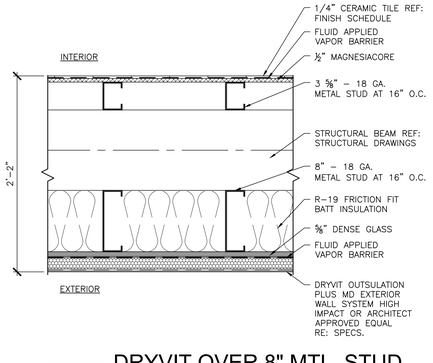
EWA-3 DRYVIT OVER 8" MTL. STUD

SCALE: 1 1/2": 1'0" EWA-3.DWG



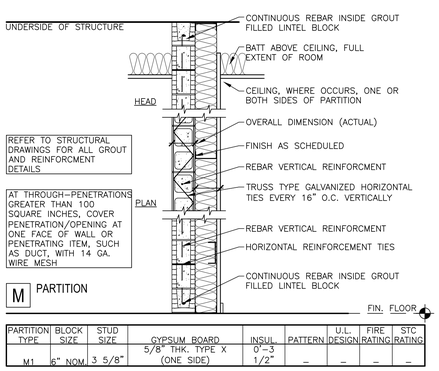
EWA-2 DRYVIT OVER 8" MTL. STUD OVER STRL. MEMBER W/ EPOXY

SCALE: 1 1/2": 1'0" EWA-2.DWG



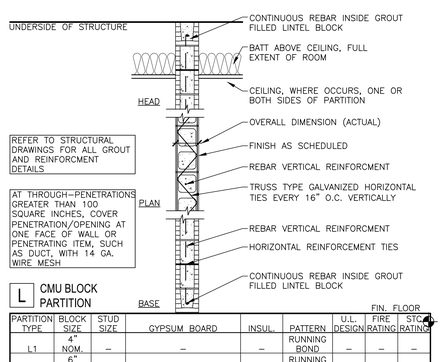
EWA-1 DRYVIT OVER 8" MTL. STUD OVER STRL. MEMBER W/ TILE

SCALE: 1 1/2": 1'0" EWA-1.DWG



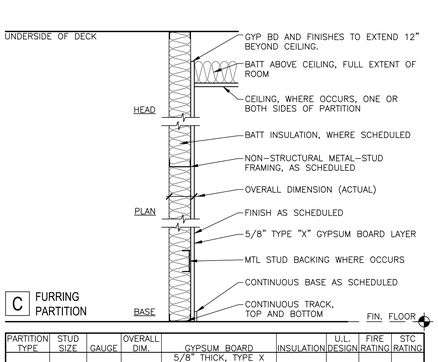
M PARTITION

PARTITION TYPE	BLOCK SIZE	STUD SIZE	GYPSUM BOARD	INSUL.	PATTERN	U.L. DESIGN	FIRE RATING	STC RATING
M1	6" NOM.	3 5/8"	5/8" THK. TYPE X (ONE SIDE)	0-3 1/2"	–	–	–	–



L CMU BLOCK PARTITION

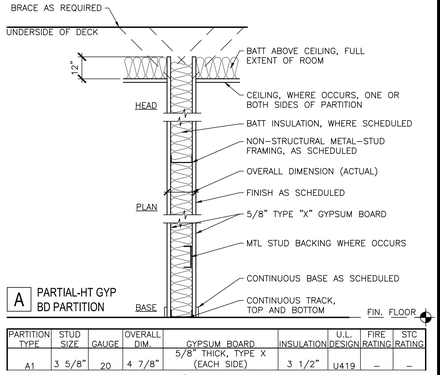
PARTITION TYPE	BLOCK SIZE	STUD SIZE	GYPSUM BOARD	INSUL.	PATTERN	U.L. DESIGN	FIRE RATING	STC RATING
L1	4" NOM.	–	–	–	RUNNING BOND	–	–	–
L2	6" NOM.	–	–	–	RUNNING BOND	–	–	–
L3	8" NOM.	–	–	–	RUNNING BOND	–	–	–
L4	12" NOM.	–	–	–	RUNNING BOND	–	–	–



C FURRING PARTITION

PARTITION TYPE	STUD SIZE	GAUGE	OVERALL DIM.	GYPSUM BOARD	INSULATION	U.L. DESIGN	FIRE RATING	STC RATING
C1	3 5/8"	20	4 1/4"	5/8" THICK, TYPE X (EXPOSED SIDE)	3 1/2"	–	–	–

DESIGN LOAD =5 PSF; DEFLECTION =L/240 MAX; NON-STRUCTURAL COMPOSITE PARTITIONS; VERTICAL SPAN PER INTERIOR FRAMING LIMITING HEIGHTS



A PARTIAL-HT GYP BD PARTITION

PARTITION TYPE	STUD SIZE	GAUGE	OVERALL DIM.	GYPSUM BOARD	INSULATION	U.L. DESIGN	FIRE RATING	STC RATING
A1	3 5/8"	20	4 7/8"	5/8" THICK, TYPE X (EACH SIDE)	3 1/2"	U419	–	–

DESIGN LOAD =5 PSF; DEFLECTION =L/240 MAX; NON-STRUCTURAL COMPOSITE PARTITIONS; VERTICAL SPAN PER INTERIOR FRAMING LIMITING HEIGHTS

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL
REGISTERED ARCHITECT
CARLOS M. WARREN
18378
STATE OF TEXAS
EXP 10-31-19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

A6.01
WALL TYPES

ROOM FINISH SCHEDULE

ROOM NO.	ROOM NAME	BASE	FLOOR	WALL				CEILING	NOTES
				NORTH	EAST	SOUTH	WEST		
101	VESTIBULE	–	RE: SPECS	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–2, PNT–1C	
102	LOBBY	RB–1	CONC–1	GYP.BD.–1, PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–4B	GYP.BD.–1, PNT–1B	MCP; GYP–1, PNT–2C, PNT–3C	
103	VESTIBULE	–	RE: SPECS	PNT–1A	PNT–1A	PNT–1A	MG, PNT–1A	MG; PNT–1A	
104	UTRGV RECEPTION	RB–1	CONC–1	PNT–4B	PNT–1B	PNT–1B	PNT–1B	ACG–1, ACT–1; GYP–1, PNT–2C, PNT–3C	
105	ADMIN	RB–1	CONC–1	GYP.BD.–1, PNT–3B	GYP.BD.–1; PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1; GYP–1, PNT–1C	
106	CORRIDOR	RB–1	CONC–1	PNT–1B	GYP.BD.–1; PNT–1B	PNT–1B	PNT–4B	ACG–1, ACT–1	
107	CORRIDOR	RB–1	CONC–1	PNT–1B	GYP.BD.–1; PNT–1B	PNT–1B	PNT–1B	ACG–1, ACT–1	
108	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–5B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
109	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–5B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
110	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–5B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
111	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–5B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
112	CONFERENCE	RB–1	CONC–1	GYP.BD.–1, PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–4B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1; GYP–1, PNT–1C	
113	COACH RR	PT–2, PT–17; GRT–2	PT–2, PT–17; GRT–2	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	GYP–2, PNT–1C	
114	ELECTRICAL	RB–1	CONC–1	PNT–2B	PNT–1B	PNT–1B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1	
115	PSJA RECEPTION	RB–1	CONC–1	PNT–1B	PNT–1B	PNT–4B	PNT–4B	ACG–1, ACT–1; GYP–1, PNT–1C, PNT–2C, PNT–3C	
116	ADMIN.	RB–1	CONC–1	GYP.BD.–1, PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–3B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1; GYP–1, PNT–1C	
117	CORRIDOR	RB–1	CONC–1	PNT–4B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–3B	PNT–4B	ACG–1, ACT–1	
118	CORRIDOR	RB–1	CONC–1	PNT–1B	PNT–1B	PNT–2B	PNT–1B	ACG–1, ACT–1	
119	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–5B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
120	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–6B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–6B	ACG–1, ACT–1	
121	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–2B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–5B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1	
122	COACH	RB–1	CONC–1	GYP.BD.–1, PNT–1B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–5B	GYP.BD.–1, PNT–5B	ACG–1, ACT–1	
123	COACH RR	PT–2, PT–17; GRT–2	PT–2, PT–17; GRT–2	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	GYP–2, PNT–1C	
124	CONFERENCE	RB–1	CONC–1	GYP.BD.–1, PNT–4B	GYP.BD.–1; PNT–1B	GYP.BD.–1, PNT–1B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1; GYP–1, PNT–1C	
125	JANITOR	RB–1	CONC–1	PNT–1B	PNT–1B	PNT–3B	PNT–1B	ACG–1, ACT–1	
126	IT	RB–1	CONC–1	PNT–1B	PNT–1B	PNT–1B	GYP.BD.–1, PNT–1B	ACG–1, ACT–1	
127	CORRIDOR	RB–1	CONC–1	GYP.BD.–1, PNT–1A	GYP.BD.–1; PNT–1A	GYP.BD.–1, PNT–1A	GYP.BD.–1, PNT–1A	MG; PNT–1A	
128	ELEVATOR	REFER SPECIFICATIONS							
129	ELEVATOR EQUIPMENT	RB–1	CONC–1	PNT–1B	PNT–1B	PNT–1B	PNT–1B	EXPOSED, DRYFALL WHITE	
130	CORRIDOR	RB–1	CONC–1	PNT–1A	PNT–1A	MG; PNT–2A, PNT–4A	PNT–1A	MG; PNT–1A	
131	STAIRS	RB–1	CONC–1	PNT–2A	PNT–1A	PNT–1A	PNT–1A	PNT–1A	
132	CONCESSION	RB–1	CONC–1	PNT–3A	PNT–1A	PNT–1A	PNT–1A	ACG–1, ACT–1	
133	STORAGE	RB–1	CONC–1	PNT–1A	PNT–1A	PNT–1A	PNT–1A	EXPOSED, DRYFALL WHITE	
134	RR	RB–1	CONC–1	PNT–1A; CT–1; CT–2; CT–3; GRT–3	PNT–1A; CT–1; CT–2; CT–3; GRT–3	PNT–1A; CT–1; CT–2; CT–3; GRT–3	PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG; PNT–1A	
135	CONDITIONING	RB–1	CONC–1	PNT–5A	PNT–1A	PNT–1A	PNT–1A	EXPOSED, DRYFALL BLACK	
136	STAIRS	RB–1	CONC–1	PNT–1A	PNT–1A	PNT–1A	PNT–1A	PNT–1A	
137	CORRIDOR	RB–1	CONC–1	PNT–1A	PNT–3A	PNT–3A	PNT–1A	MG; PNT–1A	
138	WOMEN RR	–	CONC–1	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG; PNT–1A	
139	MEN RR	–	CONC–1	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1A; CT–1; CT–2; CT–3; GRT–3	MG; PNT–1A	
140	CLASSROOM	RB–1	CONC–1	PNT–2A	PNT–1A	PNT–1A	PNT–1A	ACG–1, ACT–1	
141	STAIRS	RB–1	CONC–1	PNT–1A	PNT–2A	PNT–1A	GYP.BD.–1, PNT–1A	PNT–1A	
142	STORAGE	RB–1	CONC–1	GYP.BD.–1; PNT–1B	GYP.BD.–1; PNT–3B	MG, PNT–3B	GYP.BD.–1, PNT–3B	EXPOSED, DRYFALL WHITE	
143	RISER ROOM	RB–1	CONC–2	GYP.BD.–1, PNT–1A	GYP.BD.–1; PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
144	TIMING	RB–1	CONC–1	GYP.BD.–2, PNT–1A	GYP.BD.–2; PNT–1A	GYP.BD.–2, PNT–3A	GYP.BD.–2, PNT–1A	ACG–1, ACT–1	
145	STORAGE	RB–1	CONC–1	GYP.BD.–1; PNT–2B	GYP.BD.–1; PNT–3B	MG, PNT–3B	GYP.BD.–1, PNT–3B	EXPOSED, DRYFALL WHITE	
146	CORRIDOR	PT–2; GRT–2	PT–2; GRT–2	GYP.BD.–1; PNT–1A	GYP.BD.–1; PNT–1A	GYP.BD.–1, PNT–1A	MG, PNT–2A	ACG–1, ACT–1	
147	HEAD COACH	RB–1	CONC–1	MG; PNT–1A	GYP.BD.–2; PNT–1A	GYP.BD.–2; PNT–2A	MG; PNT–2A	MG; PNT–1A	
148	MENS RR	PT–2; PT–17; GRT–2;	PT–2; GRT–2; PT–17; PT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; PT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; GRT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; PT–3; GRT–3	GYP.BD.–2, PNT–1B; CT–1; CT–2; CT–3; GRT–3	MG; PNT–1A	
149	CHANGING ROOM	NOT USED							
150	CORRIDOR	PT–2; GRT–2	PT–2; GRT–2	GYP.BD.–2, PNT–2A	GYP.BD.–2; PNT–1A	GYP.BD.–2; PNT–1A	MG, PNT–1A	ACG–1, ACT–1	
151	HEAD COACH	RB–1	CONC–1	MG; PNT–1A	GYP.BD.–2; PNT–1A	GYP.BD.–2, PNT–2A	MG, PNT–1A	MG; PNT–1A	
152	WOMENS RR	PT–2; PT–17; GRT–2;	PT–2; GRT–2; PT–17; PT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; PT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; GRT–3	PNT–1B; CT–1; CT–2; CT–3; PT–1; PT–3; GRT–3	GYP–2; PNT–1B; CT–1; CT–2; CT–3; GRT–3	MG; PNT–1A	
153	CHANGING ROOM	NOT USED							
154	LIFE GUARD BREAK ROOM	RB–1	CONC–1	PNT–3A	PNT–1A	PNT–1A	PNT–3A	MG; PNT–1A	
155	MEN RR	PT–2; GRT–2	PT–2; GRT–2	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1B; CT–1; CT–2; CT–3; GRT–3	GYP–2, PNT–1C	
156	WOMEN RR	PT–2; GRT–2	PT–2; GRT–2	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	MG, PNT–1B; CT–1; CT–2; CT–3; GRT–3	GYP–2, PNT–1C	
157	MECHANICAL	RB–1	CONC–2	PNT–1A	PNT–1A	PNT–1A	PNT–1A	EXPOSED, DRYFALL WHITE	
158	FIRST AID	RB–1	CONC–1	PNT–3A	PNT–3A	PNT–1A	PNT–1A	MG; PNT–1A	
159	TRAINER	RB–1	CONC–1	PNT–1A	PNT–3A	PNT–3A	PNT–1A	MG; PNT–1A	
160	DIVING POOL	PT–2; GRT–2	PT–1; PT–2; PT–3; GRT–2	MG, PNT–1A	PNT–1A	PNT–1A	MG; PNT–1A, CT–2, CT–3, CT–1; GRT–3	EXPOSED, DRYFALL WHITE	
161	50M POOL	PT–2; GRT–2	PT–1; PT–2; PT–3; GRT–2	PNT–1A	MG, PNT–1A	PNT–1A	MG; PT–4, PT–5, PT–6, PT–7, GRT–1; PT–8, PT–9, PT–10, PT–11, PT–12, PT–13, PT–14, PT–15, PT–16	EXPOSED, DRYFALL WHITE	
162	MECHANICAL	RB–1	CONC–2	MG, PNT–1A	MG; PNT–3A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
163	POOL EQUIPMENT YARD	RB–1	CONC–1	PNT–1A	PNT–1A	PNT–1A	PNT–1A	EXPOSED, DRYFALL WHITE	
164	ELECTRICAL	RB–1	CONC–2	PNT–1B	PNT–1B	PNT–1B	PNT–1B	EXPOSED, DRYFALL WHITE	
165	CALCIUM HYPO SYST.	RB–1	CONC–2	PNT–1B	PNT–1B	PNT–1B	PNT–1B	EXPOSED, DRYFALL WHITE	
166	ACID ROOM	RB–1	CONC–2	PNT–1B	PNT–1B	PNT–1B	PNT–1B	EXPOSED, DRYFALL WHITE	
167	STORAGE	RB–1	CONC–1	PNT–1A	PNT–1A	PNT–1A	PNT–1A	EXPOSED, DRYFALL WHITE	
168	STAIRS	RB–1	CONC–1	PNT–1A	PNT–1A	PNT–1A	PNT–1A	PNT–1A	
200	OBSERVATION	RB–1	CONC–1	MG, PNT–2A	MG, PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
201	LANDING	RB–1	CONC–1	MG, PNT–2A	PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
202	SECTION "A"	RB–1	CONC–1	MG, PNT–2A	MG, PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
203	SECTION "B"	RB–1	CONC–1	MG, PNT–2A	PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
204	SECTION "C"	RB–1	CONC–1	MG, PNT–2A	PNT–1A	MG, PNT–1A	MG, PNT–1A	EXPOSED, DRYFALL WHITE	
205	PRIVATE VIEWING ROOM	RB–1	CONC–1	PNT–2A	PNT–1A	PNT–1A	PNT–1A	ACG–1, ACT–1	
206	RR	PT–2; GRT–2	CONC–1	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	PNT–1B; CT–1; CT–2; CT–3; GRT–3	GYP–2; PNT–1C	

GENERAL NOTES

1. ALL CEILING HEIGHTS TO BE 9'–0" A.F.F. UNLESS OTHERWISE NOTED.
2. ALL WALL FINISH SURFACES TO HAVE SMOOTH FINISH – NO TEXTURE.
3. ALL WALLS WITH NEW FINISHES TO RECEIVE ONE PRIMER COAT AND TWO FINISH COATS OF NEW PAINT FINISH. REFER SPECIFICATIONS.
4. WOMENS RR & MENS RR ALL WALLS TO BE MOISTURE RESISTANT GYPSUM BOARD. REFER SCHEDULE FOR APPLIED FINISHES.
5. REFER TO SHEET A1.41 FOR FLOOR PATTERN PLAN.
6. REFER TO SHEET A1.42 FOR WALL ACCENT PAINT PLANS.
7. REFER TO SHEET A4.12 FOR RESTROOM WALL TILE PATTERNS.

03 35 00 CONCRETE FINISHING

CONC–1
SEALED

CONC–2
EXPOSED

09 20 00 PLASTER & GYPSUM BOARD

GYP–1
STANDARD

GYP–2
MOISTURE RESISTANT

MG(MAGNESIACORE)
RE: SPECIFICATIONS

09 30 00 TILING

CT–1
MANUFACTURER: DALTILE
LINE/BRAND: WALL TILE
COLOR: 0190 ARCTIC WHITE
FINISH: SEMI–GLOSS
SIZE: 4"X8"

CT–2
MANUFACTURER: DALTILE
LINE/BRAND: WALL TILE
COLOR: K176 ICE GREY
FINISH: SEMI–GLOSS
SIZE: 4"X8"

CT–3
MANUFACTURER: DALTILE
LINE/BRAND: WALL TILE
COLOR: Q174 SEA BREEZE
FINISH: SEMI–GLOSS
SIZE: 4"X8"

GRT–1
MANUFACTURER: MAPEI
COLOR: 38 AVALANCHE

GRT–2
MANUFACTURER: MAPEI
COLOR: 02 PEWTER

GRT–3
MANUFACTURER: MAPEI
COLOR: 93 WARM GRAY

09 50 00 CEILINGS

ACG–1
REFER SPECIFICATIONS
SECTION 09 51 00

ACT–1
REFER SPECIFICATIONS
SECTION 09 51 13

MCP
MANUFACTURER: ARMSTRONG CEILING
LINE/BRAND: SERPENTINA
COLOR: WHITE
SIZE: 24X72
PATTERN: HILL AND VALLEY

09 60 00 FLOORING

PT–1
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D037– PEPPER WHITE
SIZE: 2"X2" WITH BUILD–UP BASE

PT–2
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D200 DESERT GRAY SPECKLE
SIZE: 2"X2" WITH BUILD–UP BASE

PT–3
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D159– OCEAN BLUE
SIZE: 2"X2" WITH BUILD–UP BASE

PT–4
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D617– ARCTIC WHITE
SIZE: 2"X2"

PT–5
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D159– OCEAN BLUE
SIZE: 2"X2"

PT–6
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D621– NAUTICAL BLUE
SIZE: 2"X2"

PT–7
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D189– NAVY
SIZE: 2"X2"

PT–8
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D620– SUNSHINE
SIZE: 2"X2"

PT–9
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D090– PUMPKIN SPICE
SIZE: 2"X2"

PT–10
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D017– RED
SIZE: 2"X2"

PT–11
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D622– CLEMENTINE
SIZE: 2"X2"

PT–12
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D139– CRISP LINEN
SIZE: 2"X2"

PT–13
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 4
COLOR: D091– MOON BEAM
SIZE: 2"X2"

PT–14
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 4
COLOR: D181– MUSTARD
SIZE: 2"X2"

PT–15
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 3
COLOR: D007– CINNAMON RANGE
SIZE: 2"X2"

PT–16
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 3
COLOR: D171– CITYLINE KOHL
SIZE: 2"X2"

PT–17
MANUFACTURER: DALTILE
LINE/BRAND: KEYSTONE GROUP 1
COLOR: D037– PEPPER WHITE
SIZE: 1"X1" WITH BUILD–UP BASE

CPT–1
MANUFACTURER: MANNINGTON
LINE/BRAND: RIDGELINE
COLOR: 15906 NATIVE
SIZE: 12"X48" PLANK

RB–1
MANUFACTURER: ROPPE
COLOR: 175 SLATE
SIZE: 4" COVE BASE

09 90 00 PAINTING AND COATING

PNT–1A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7757 HIGH REFLECTIVE WHITE
FINISH: EPOXY

PNT–1B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7757 HIGH REFLECTIVE WHITE
FINISH: EGGSHELL

PNT–1C
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7757 HIGH REFLECTIVE WHITE
FINISH: FLAT

PNT–2A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6803 DANUBE
FINISH: EPOXY

PNT–2B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6803 DANUBE
FINISH: EGGSHELL

PNT–2C
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6803 DANUBE
FINISH: FLAT

PNT–3A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW9061 REST ASSURED
FINISH: EPOXY

PNT–3B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW9061 REST ASSURED
FINISH: EGGSHELL

PNT–4A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6253 OLYMPUS WHITE
FINISH: EPOXY

PNT–4B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6253 OLYMPUS WHITE
FINISH: EGGSHELL

PNT–4C
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6253 OLYMPUS WHITE
FINISH: FLAT

PNT–4D
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6253 OLYMPUS WHITE
FINISH: ELASTOMERIC

PNT–5A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7072 ONLINE
FINISH: EPOXY

PNT–5B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7072 ONLINE
FINISH: EGGSHELL

PNT–5C
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7072 ONLINE
FINISH: ELASTOMERIC

PNT–6
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW6966 BLUEBLOOD
FINISH: ELASTOMERIC

PNT–7A
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW9162 AFRICAN GRAY
FINISH: ELASTOMERIC

PNT–7B
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW9162 AFRICAN GRAY
FINISH: ENAMEL

PNT–8
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7074 SOFTWARE
FINISH: ELASTOMERIC

PNT–9
MANUFACTURER: SHERWIN WILLIAMS
COLOR: SW7076 CYBERSPACE
FINISH: ELASTOMERIC

10 20 00 INTERIOR SPECIALTIES

FEC–1
5 LBS. LOADED STREAM FIRE EXTINGUISHER WITH RECESSED CABINET

TP–1
MANUFACTURER: SCRANTON PRODUCTS
LINE: HINY HIDERS
COLOR: BLUEBERRY ORANGE PEEL

12 30 00 CASEWORK

PL–1 (VERTICAL)
MANUFACTURER: FORMICA
LINE: PLASTIC
COLOR: CITADEL 1097–MC
FINISH: MICRODOT

PL–2 (VERTICAL)
MANUFACTURER: FORMICA
LINE: PLASTIC
COLOR: BRITE WHITE 459–90
FINISH: GLOSS

PL–3 (REVEALS)
MANUFACTURER: FORMICA
LINE: PLASTIC
COLOR: BLACK 909–58
FINISH: MATTE

PL–4 (VERTICAL)
MANUFACTURER: FORMICA
LINE: PLASTIC
COLOR: SATURN GREY 2770–58
FINISH: MATTE

PL–5 (HORIZONTAL)
MANUFACTURER: FORMICA
LINE: PLASTIC
COLOR: WHITE DROPS 8824–58
FINISH: MATTE

SS–1
MANUFACTURER: LG HAUSYS
LINE: HI–MACS
COLOR: ARCTIC WHITE G034

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

SEAL

REGISTERED ARCHITECT 18378 STATE OF TEXAS

EXP 10–31–19

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

A6.11
ROOM FINISH SCHEDULE

OPENING			DOOR					FRAME			
No.	LOCATION TO	SWING	FIRE RATING	TYPE	FINISH	SIZE	ELEV.	TYPE	FINISH	ELEV.	REMARKS (TO: LH / RH / LHR / RHR LOCATION)
168	50M POOL 161 TO STAIRS 168	LHR	–	FRP	–	3'–0" X 7'–0"	D	FRP	–		ALTERNATE
205	STAIRS 168 TO PRIVATE VIEWING ROOM 205	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		ALTERNATE
206	PRIVATE VIEWING ROOM 205 TO RR 206	LHR	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		ALTERNATE

WINDOW SCHEDULE

ELEV.	TYPE	FRAME TYPE		GLAZING	SIZE	REMARKS
		TYPE	FINISH			
A	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	11'–0" X 26'–2"	
B	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	11'–0" X 19'–2"	
C	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	9'–2" X 5'–0"	
D	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	9'–2" X 10'–0"	
E	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	7'–2" X 9'–6"	
F	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	6'–8" X 14'–4"	
G	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1" INSULATED LOW–E TINTED REFLECTIVE GLASS	7'–2" X 14'–4"	
H	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	4'–8" X 5'–0"	
I	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	4'–0" X 5'–0"	
J	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	4'–0" X 6'–0"	
K	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	4'–8" X 19'–2"	
L	FIXED	ALUMINUM	KAWNEER DEEP BLUE	1/4" CLEAR SAFETY GLASS	4'–8" X 4'–8"	

NOTE:

DOOR SCHEDULE

OPENING			DOOR					FRAME			
No.	LOCATION TO	SWING	FIRE RATING	TYPE	FINISH	SIZE	ELEV.	TYPE	FINISH	ELEV.	REMARKS (TO: LH / RH / LHR / RHR LOCATION)
101A	EXTERIOR TO VESTIBULE 101	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
101B	EXTERIOR TO VESTIBULE 101	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
102A	VESTIBULE 101 TO LOBBY 102	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
102B	VESTIBULE 101 TO LOBBY 102	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
103A	LOBBY 102 TO VESTIBULE 103	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
103B	LOBBY 102 TO VESTIBULE 103	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
103C	VESTIBULE 103 TO 50M POOL 161	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
103D	VESTIBULE 103 TO 50M POOL 161	DOUBLE	–	ALUMINUM	KAWNEER DEEP BLUE	(2) 3'–0" X 7'–0"	A	ALUM.	KAWNEER DEEP BLUE		
105	LOBBY 102 TO ADMIN. 105	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
106A	LOBBY 102 TO CORRIDOR 106	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	F	H.MTL	PNT–7B		
106B	EXTERIOR TO CORRIDOR 106	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	G	H.MTL	PNT–7B		
108	CORRIDOR 107 TO COACH 108	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
109	CORRIDOR 107 TO COACH 109	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
110	CORRIDOR 107 TO COACH 110	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
111	CORRIDOR 107 TO COACH 111	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
112	CORRIDOR 106 TO CONFERENCE 112	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
113	CORRIDOR 106 TO COACH RR 113	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
114	CORRIDOR 106 TO ELECTRICAL 114	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
116	LOBBY 102 TO ADMIN. 116	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
117A	LOBBY 102 TO CORRIDOR 117	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	F	H.MTL	PNT–7B		
117B	EXTERIOR TO CORRIDOR 117	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	G	H.MTL	PNT–7B		
117C	CORRIDOR 117 TO CORRIDOR 130	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	F	H.MTL	PNT–7B		
119	CORRIDOR 118 TO COACH 119	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
120	CORRIDOR 118 TO COACH 120	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
121	CORRIDOR 118 TO COACH 121	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
122	CORRIDOR 118 TO COACH 122	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
123	CORRIDOR 117 TO COACH RR 123	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
124	CORRIDOR 117 TO CONFERENCE 124	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
125	CORRIDOR 117 TO JANITOR 125	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
126	CORRIDOR 117 TO IT 126	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
127	CORRIDOR 127 TO 50M POOL 161	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	F	FRP	–		
129	CORRIDOR 127 TO ELEVATOR EQUIPMENT 129	LH	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
130A	EXTERIOR TO CORRIDOR 130	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	G	H.MTL	PNT–7B		
130B	EXTERIOR TO CORRIDOR 130	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	G	H.MTL	PNT–7B		
132A	CORRIDOR 130 TO CONCESSION 132	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
132B	CORRIDOR 130 TO CONCESSION 132	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
133	CONCESSION 132 TO STORAGE 133	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
134	CORRIDOR 130 TO RR 134	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
135A	CORRIDOR 130 TO CONDITIONING 135	RH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
135B	CORRIDOR 130 TO CONDITIONING 135	LH	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
137A	CORRIDOR 130 TO CORRIDOR 137	LHR	–	H.MTL	PNT–7B	3'–0" X 7'–0"	E	H.MTL	PNT–7B		
137B	CORRIDOR 137 TO 50M POOL 161	LH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
140	CORRIDOR 130 CLASSROOM 140	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	F	H.MTL	PNT–7B		
142	CORRIDOR 130 TO STORAGE 142	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	H	H.MTL	PNT–7B		
143	EXTERIOR TO RISER ROOM 143	RHR	–	H.MTL	PNT–7B	3'–0" X 7'–0"	C	H.MTL	PNT–7B		
144	50M POOL 161 TO TIMING 144	RH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
145	50M POOL 161 TO STORAGE 145	RHR	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
146	50M POOL 161 TO CORRIDOR 146	LHR	–	FRP	–	3'–0" X 7'–0"	B	FRP	–		
147	CORRIDOR 146 TO HEAD COACH 147	LH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
148	CORRIDOR 146 TO MEN 148	LHR	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
150	50M POOL 161 TO CORRIDOR 150	RHR	–	FRP	–	3'–0" X 7'–0"	B	FRP	–		
151	CORRIDOR 150 TO HEAD COACH 151	RH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
152	CORRIDOR 150 TO WOMEN 152	RHR	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
154	50M POOL 161 TO LIFE GUARD BREAK ROOM 154	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	F	FRP	–		
155	LIFE GUARD BREAK ROOM 154 TO MEN RR 155	RH	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
156	LIFE GUARD BREAK ROOM 154 TO WOMEN RR 156	LH	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
157A	EXTERIOR TO MECHANICAL 157	OVERHEAD	–	–	–	12'–0" X 12'–0"	–	–	–		
157B	EXTERIOR TO MECHANICAL 157	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	H	H.MTL	PNT–7B		
157C	EXTERIOR TO MECHANICAL 157	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	H	H.MTL	PNT–7B		
157D	EXTERIOR TO MECHANICAL 157	OVERHEAD	–	–	–	12'–0" X 12'–0"	–	–	–		
158	DIVING POOL 160 TO FIRST AID 158	RH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
159A	DIVING POOL 160 TO TRAINER 159	LH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
159B	TRAINER 159 TO FIRST AID 158	RH	–	FRP	–	3'–0" X 7'–0"	E	FRP	–		
160A	EXTERIOR TO DIVING POOL 160	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	G	ALUM	KAWNEER DEEP BLUE		
160B	EXTERIOR TO DIVING POOL 160	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	G	ALUM	KAWNEER DEEP BLUE		
161A	EXTERIOR TO 50M POOL 161	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	G	ALUM	KAWNEER DEEP BLUE		
161B	EXTERIOR TO 50M POOL 161	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	G	ALUM	KAWNEER DEEP BLUE		
162A	EXTERIOR TO MECHANICAL 162	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	H	H.MTL	PNT–7B		
162B	EXTERIOR TO MECHANICAL 162	OVERHEAD	–	–	–	12'–0" X 12'–0"	–	–	–		
163A	50M POOL 161 TO POOL EQ. YARD 163	RHR	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
163B	EXTERIOR TO POOL EQ. YARD 163	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	H	FRP	–		
163C	50M POOL 161 TO POOL EQ. YARD 163	RHR	–	FRP	–	3'–0" X 7'–0"	C	FRP	–		
164	EXTERIOR TO ELECTRICAL 164	DOUBLE	–	H.MTL	PNT–7B	(2) 3'–0" X 7'–0"	H	H.MTL	PNT–7B		
165	EXTERIOR TO CALCIUM HYPO SYS. 165	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	H	ALUM	KAWNEER DEEP BLUE		
166	EXTERIOR TO ACID RM. 166	RHR	–	FRP	–	3'–0" X 7'–0"	C	ALUM	KAWNEER DEEP BLUE		
167	50M POOL 161 TO STORAGE 167	DOUBLE	–	FRP	–	(2) 3'–0" X 7'–0"	H	FRP	–		

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

SEAL

REGISTERED ARCHITECT JAIME A. PARRA 18378 STATE OF TEXAS

EXP 10–31–19

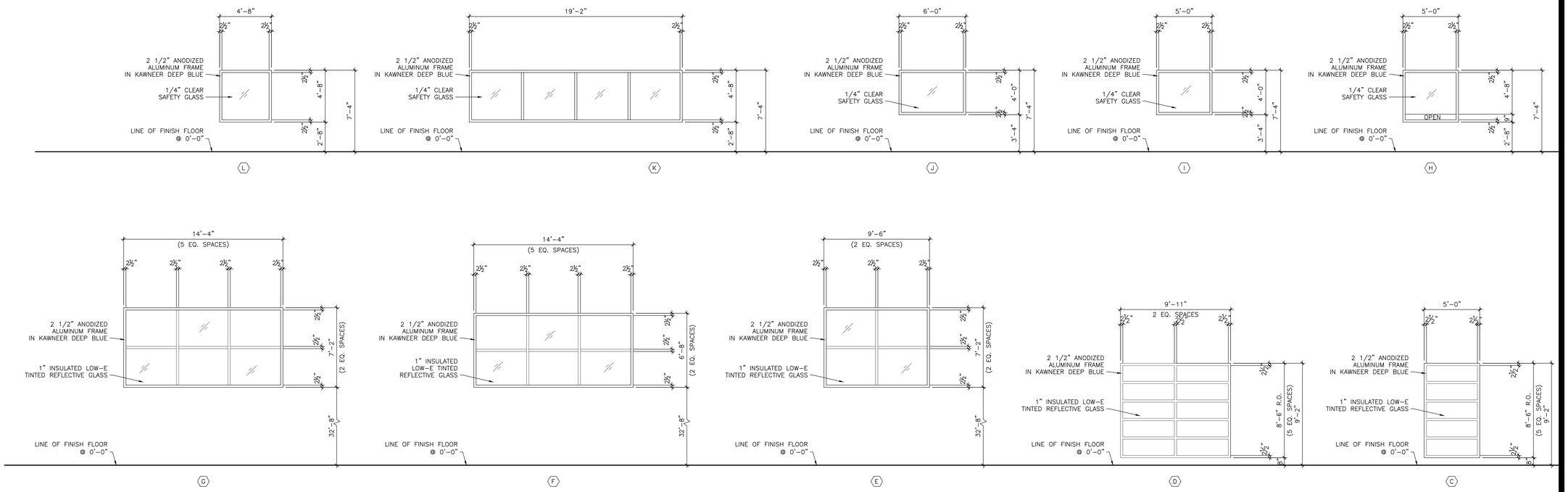
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

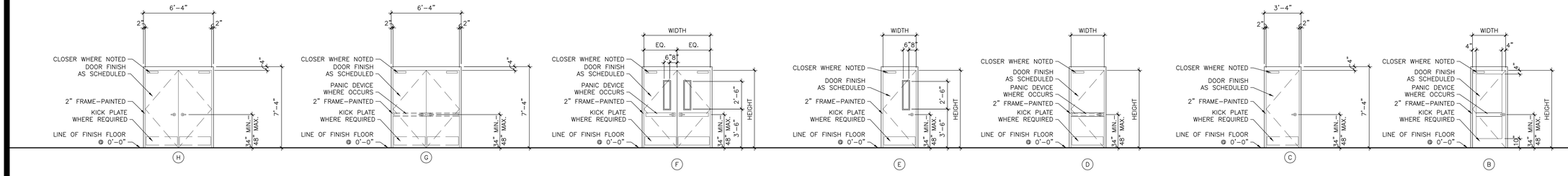
3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

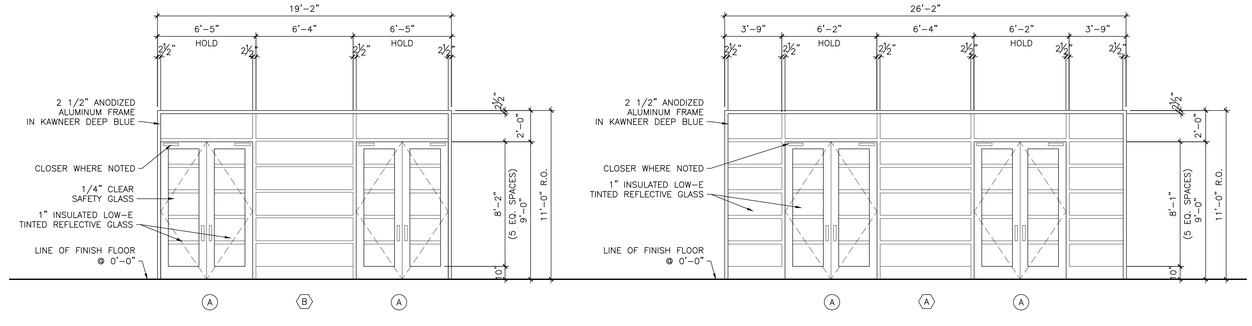
A6.21
DOOR AND WINDOW SCHEDULES



3 WINDOW ELEVATIONS
SCALE: 1/4" = 1'-0"



2 DOOR ELEVATIONS
SCALE: 1/4" = 1'-0"



1 DOOR FRAME □WINDOW ASSEMBLY ELEVATIONS
SCALE: 1/4" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT
KAMA K. WARREN
18378
STATE OF TEXAS

EXP 10-31-19

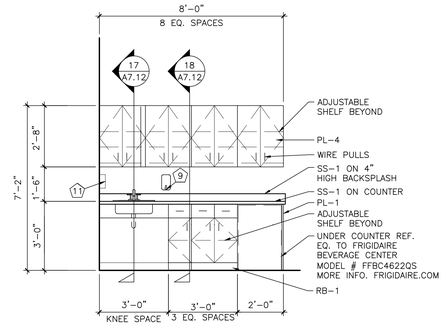
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

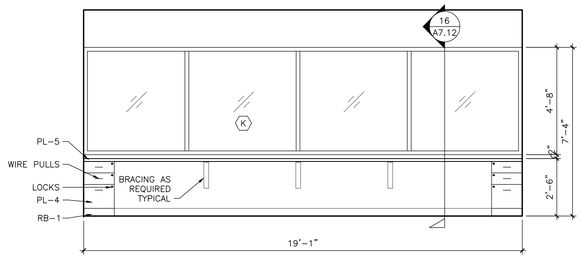
PROJECT	971805
DATE	06/07/2019
REVISED	

A6.22
DOOR AND WINDOW ELEVATIONS



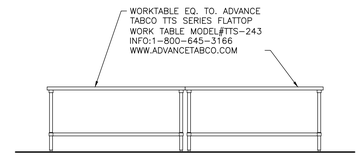
(ALT.#1) MILLWORK ELEVATION PRIVATE VIEWING ROOM 200

15 SCALE:3/8"=1'0" MWORK_ELEV_018



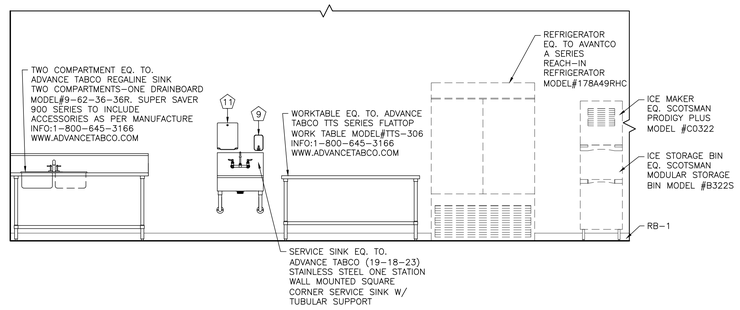
MILLWORK ELEVATION TIMING 144

14 SCALE:3/8"=1'0" MWRK_ELEV_016



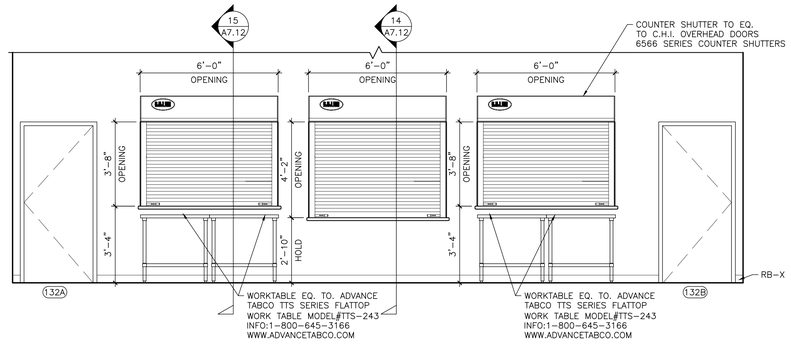
MILLWORK ELEVATION CONCESSION 132

13 SCALE:3/8"=1'0" MWORK_ELEV_012



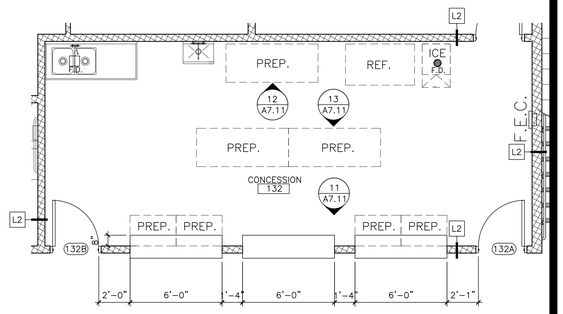
MILLWORK ELEVATION CONCESSION 132

12 SCALE:3/8"=1'0" MWORK_ELEV_011



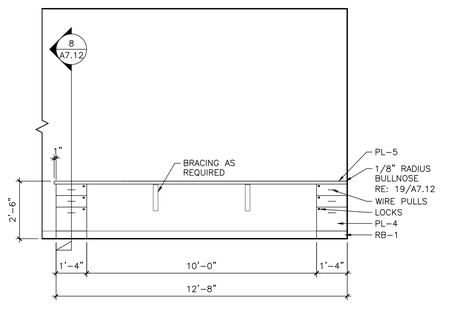
MILLWORK ELEVATION CONCESSION 132

11 SCALE:3/8"=1'0" MWORK_ELEV_009



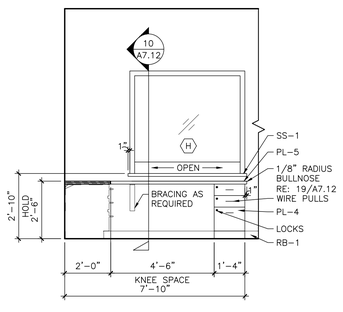
ENLARGED PLAN CONCESSION 132

10 SCALE:1/4"=1'0" MWORK_ELEV_006



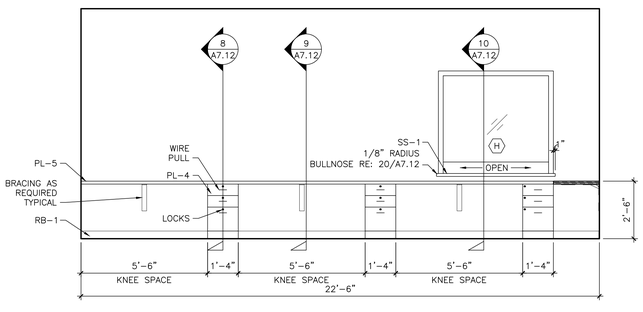
MILLWORK ELEVATION ADMIN. 105 & 116

9 SCALE:3/4"=1'0" MWRK_ELEV_00



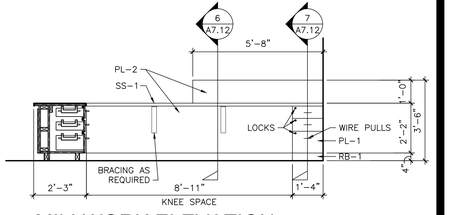
MILLWORK ELEVATION ADMIN. 105 & 116

8 SCALE:3/4"=1'0" MWRK_ELEV_012



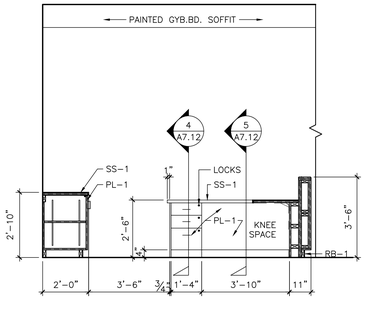
MILLWORK ELEVATION ADMIN 105 & 116

7 SCALE:3/8"=1'0" MWRK_ELEV_007



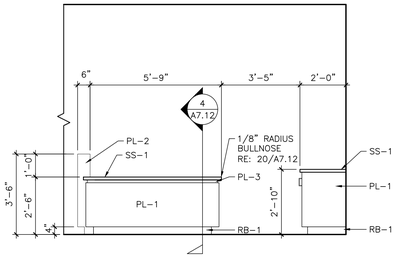
MILLWORK ELEVATION RECEPTION 104 & 115

6 SCALE:3/8"=1'0" MWORK_ELEV_006



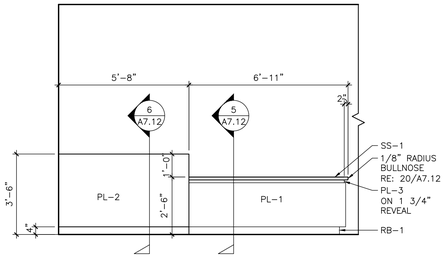
MILLWORK ELEVATION RECEPTION 104 & 115

5 SCALE:3/8"=1'0" MWORK_ELEV_004



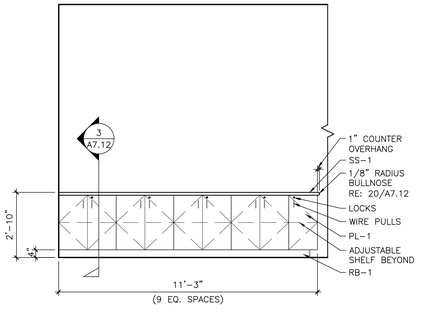
MILLWORK ELEVATION RECEPTION 104 & 115

4 SCALE:3/8"=1'0" MWORK_ELEV_003



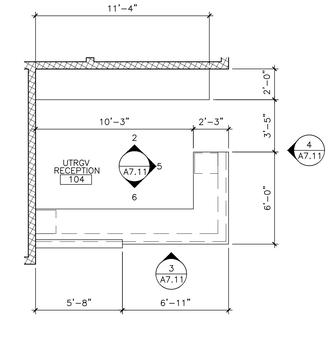
MILLWORK ELEVATION RECEPTION 104 & 115

3 SCALE:3/8"=1'0" MWORK_ELEV_001



MILLWORK ELEVATION RECEPTION 104 & 115

2 SCALE:3/8"=1'0" MWORK_ELEV_002



ENLARGED PLAN RECEPTION 104 & 115

1 SCALE:1/4"=1'0" MWORK_ELEV_002

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL
REGISTERED ARCHITECT JOHN M. WARREN 18375 STATE OF TEXAS
EXP 10-31-19

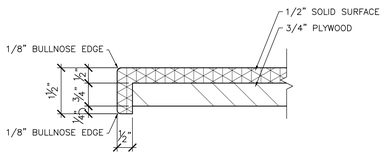
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

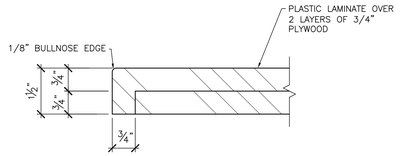
PROJECT 971805
DATE 06/07/2019
REVISED

A7.11
MILLWORK PLANS AND ELEVATIONS



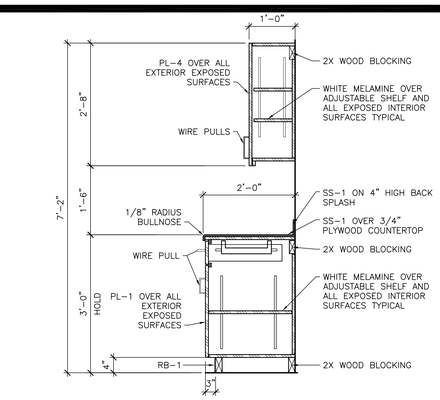
20 MILLWORK SECTION
SS COUNTER NOSING

SCALE: 6"=1'-0" MWRK_SECT_021



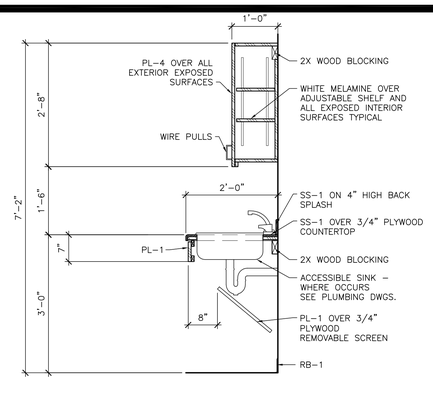
19 MILLWORK SECTION
P-LAM COUNTER NOSING

SCALE: 6"=1'-0" MWRK_SECT_022



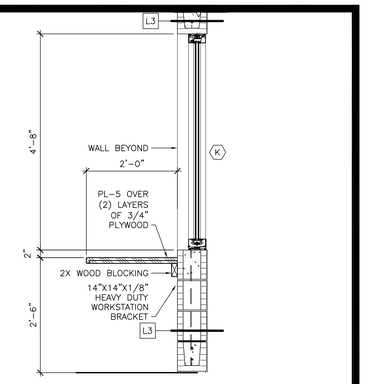
18 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_020



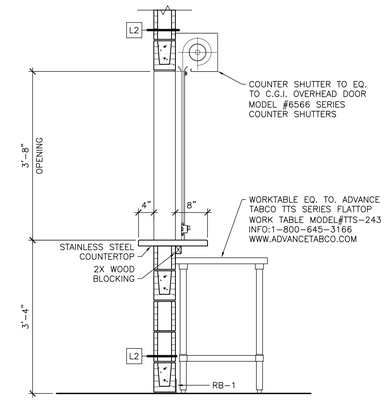
17 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_019



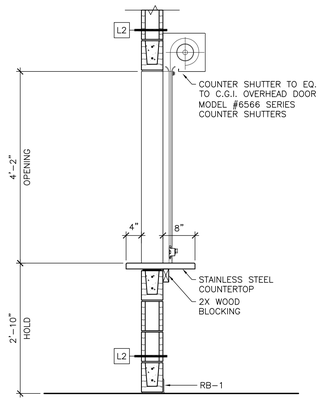
16 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_018



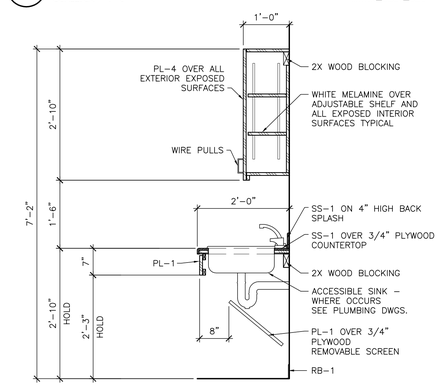
15 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_017



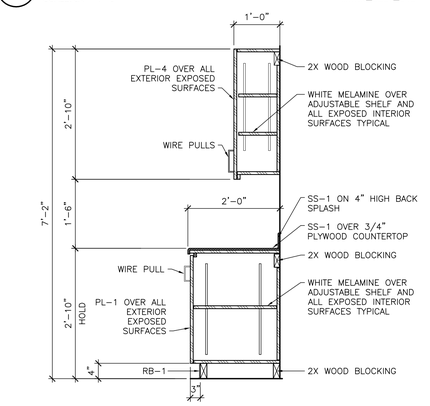
14 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_013



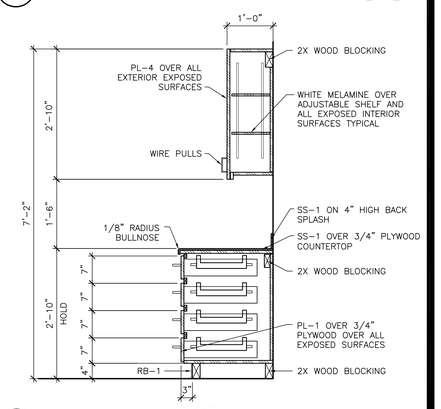
13 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_009



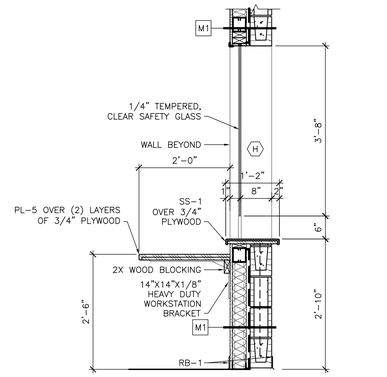
12 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_008



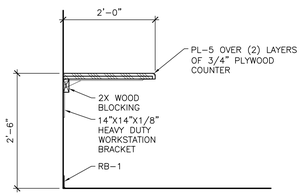
11 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_007



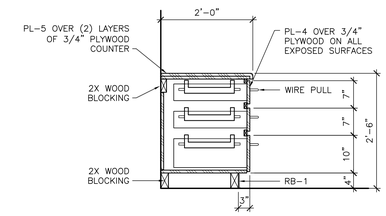
10 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_006



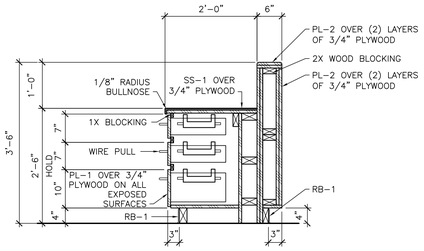
9 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_016



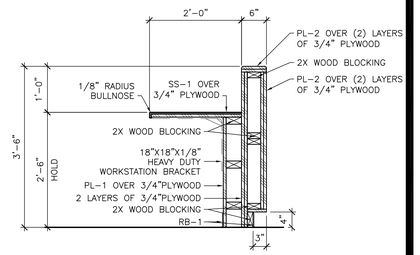
8 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_005



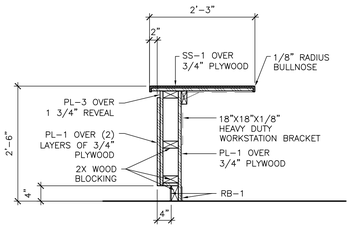
7 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_015



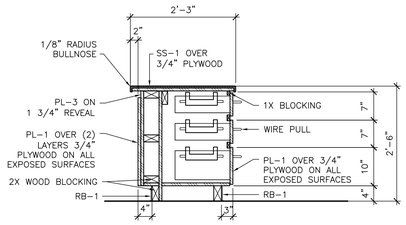
6 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_003



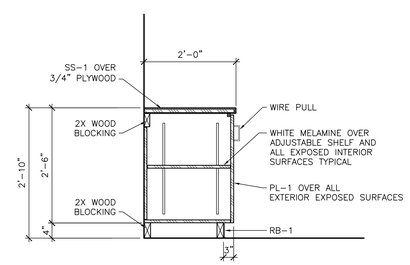
5 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_004



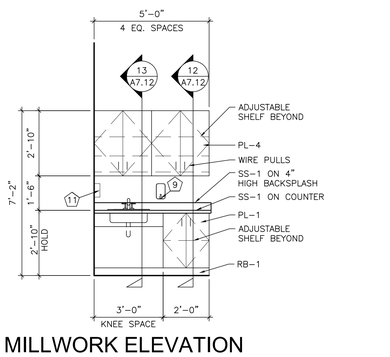
4 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_002



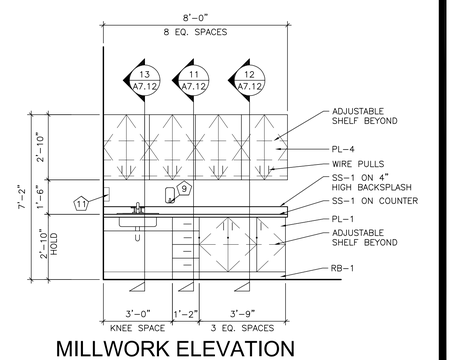
3 MILLWORK SECTION

SCALE: 3/4" = 1'-0" MWRK_SECT_001



2 MILLWORK ELEVATION
FIRST AID 158

SCALE: 3/8"=1'-0" MWORK_ELEV_017



1 MILLWORK ELEVATION
LIFE GUARD BREAKROOM 154

SCALE: 3/8"=1'-0" MWORK_ELEV_008

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

SEAL

REGISTERED ARCHITECT JOHN E. WARREN 18379 STATE OF TEXAS

EXP 10-31-19

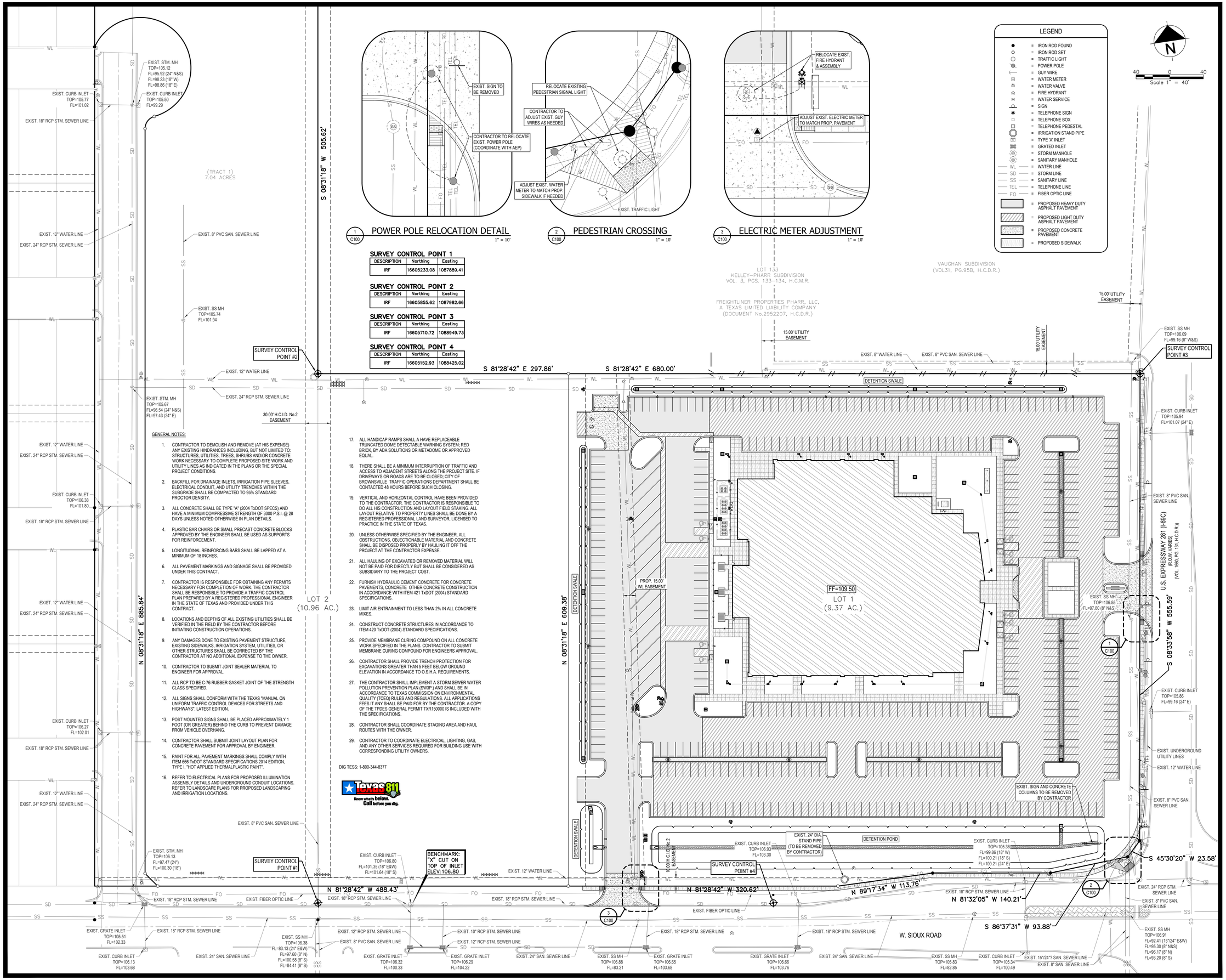
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

3001 N. CAGE BLVD
PHARR, TEXAS 78577

PROJECT 971605
DATE 06/07/2019
REVISED

A7.12
MILLWORK SECTIONS



GENERAL NOTES:

1. CONTRACTOR TO DEMOLISH AND REMOVE (AT HIS EXPENSE) ANY EXISTING HINDRANCES INCLUDING, BUT NOT LIMITED TO: STRUCTURES, UTILITIES, TREES, SHRUBS AND/OR CONCRETE WORK NECESSARY TO COMPLETE PROPOSED SITE WORK AND UTILITY LINES AS INDICATED IN THE PLANS OR THE SPECIAL PROJECT CONDITIONS.
2. BACKFILL FOR DRAINAGE INLETS, IRRIGATION PIPE SLEEVES, ELECTRICAL CONDUIT, AND UTILITY TRENCHES WITHIN THE SUBGRADE SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
3. ALL CONCRETE SHALL BE TYPE "A" (2004 TxDOT SPECS) AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 P.S.I. @ 28 DAYS UNLESS NOTED OTHERWISE IN PLAN DETAILS.
4. PLASTIC BAR CHAIRS OR SMALL PRECAST CONCRETE BLOCKS APPROVED BY THE ENGINEER SHALL BE USED AS SUPPORTS FOR REINFORCEMENT.
5. LONGITUDINAL REINFORCING BARS SHALL BE LAPPED AT A MINIMUM OF 18 INCHES.
6. ALL PAVEMENT MARKINGS AND SIGNAGE SHALL BE PROVIDED UNDER THIS CONTRACT.
7. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY PERMITS NECESSARY FOR COMPLETION OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE A TRAFFIC CONTROL PLAN PREPARED BY A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS AND PROVIDED UNDER THIS CONTRACT.
8. LOCATIONS AND DEPTHS OF ALL EXISTING UTILITIES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR BEFORE INITIATING CONSTRUCTION OPERATIONS.
9. ANY DAMAGES DONE TO EXISTING PAVEMENT STRUCTURE, EXISTING SIDEWALKS, IRRIGATION SYSTEM, UTILITIES, OR OTHER STRUCTURES SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
10. CONTRACTOR TO SUBMIT JOINT SEALER MATERIAL TO ENGINEER FOR APPROVAL.
11. ALL RCP TO BE C-76 RUBBER GASKET JOINT OF THE STRENGTH CLASS SPECIFIED.
12. ALL SIGNS SHALL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", LATEST EDITION.
13. POST MOUNTED SIGNS SHALL BE PLACED APPROXIMATELY 1 FOOT (OR GREATER) BEHIND THE CURB TO PREVENT DAMAGE FROM VEHICLE OVERHANG.
14. CONTRACTOR SHALL SUBMIT JOINT LAYOUT PLAN FOR CONCRETE PAVEMENT FOR APPROVAL BY ENGINEER.
15. PAINT FOR ALL PAVEMENT MARKINGS SHALL COMPLY WITH ITEM 666 TxDOT STANDARD SPECIFICATIONS 2014 EDITION, TYPE I, "HOT APPLIED THERMALPLASTIC PAINT".
16. REFER TO ELECTRICAL PLANS FOR PROPOSED ILLUMINATION ASSEMBLY DETAILS AND UNDERGROUND CONDUIT LOCATIONS. REFER TO LANDSCAPE PLANS FOR PROPOSED LANDSCAPING AND IRRIGATION LOCATIONS.
17. ALL HANDICAP RAMPS SHALL A HAVE REPLACEABLE TRUNCATED DOME DETECTABLE WARNING SYSTEM; RED BRICK, BY ADA SOLUTIONS OR METADOME OR APPROVED EQUAL.
18. THERE SHALL BE A MINIMUM INTERRUPTION OF TRAFFIC AND ACCESS TO ADJACENT STREETS ALONG THE PROJECT SITE. IF DRIVEWAYS OR ROADS ARE TO BE CLOSED, CITY OF BROWNSVILLE TRAFFIC OPERATIONS DEPARTMENT SHALL BE CONTACTED 48 HOURS BEFORE SUCH CLOSING.
19. VERTICAL AND HORIZONTAL CONTROL HAVE BEEN PROVIDED TO THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO DO ALL HIS CONSTRUCTION AND LAYOUT FIELD STAKING. ALL LAYOUT RELATIVE TO PROPERTY LINES SHALL BE DONE BY A REGISTERED PROFESSIONAL LAND SURVEYOR, LICENSED TO PRACTICE IN THE STATE OF TEXAS.
20. UNLESS OTHERWISE SPECIFIED BY THE ENGINEER, ALL OBSTRUCTIONS, OBJECTIONABLE MATERIAL AND CONCRETE SHALL BE DISPOSED PROPERLY BY HAULING IT OFF THE PROJECT AT THE CONTRACTOR EXPENSE.
21. ALL HAULING OF EXCAVATED OR REMOVED MATERIAL WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED AS SUBSIDIARY TO THE PROJECT COST.
22. FURNISH HYDRAULIC CEMENT CONCRETE FOR CONCRETE PAVEMENTS, CONCRETE OTHER CONCRETE CONSTRUCTION IN ACCORDANCE WITH ITEM 421 TxDOT (2004) STANDARD SPECIFICATIONS.
23. LIMIT AIR ENTRAINMENT TO LESS THAN 2% IN ALL CONCRETE MIXES.
24. CONSTRUCT CONCRETE STRUCTURES IN ACCORDANCE TO ITEM 420 TxDOT (2004) STANDARD SPECIFICATIONS.
25. PROVIDE MEMBRANE CURING COMPOUND ON ALL CONCRETE WORK SPECIFIED IN THE PLANS. CONTRACTOR TO SUBMIT MEMBRANE CURING COMPOUND FOR ENGINEERS APPROVAL.
26. CONTRACTOR SHALL PROVIDE TRENCH PROTECTION FOR EXCAVATIONS GREATER THAN 5 FEET BELOW GROUND ELEVATION IN ACCORDANCE TO O.S.H.A. REQUIREMENTS.
27. THE CONTRACTOR SHALL IMPLEMENT A STORM SEWER WATER POLLUTION PREVENTION PLAN (SW3P.) AND SHALL BE IN ACCORDANCE TO TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) RULES AND REGULATIONS. ALL APPLICATIONS FEES IT ANY SHALL BE PAID FOR BY THE CONTRACTOR. A COPY OF THE TPDES GENERAL PERMIT TXR150000 IS INCLUDED WITH THE SPECIFICATIONS.
28. CONTRACTOR SHALL COORDINATE STAGING AREA AND HAUL ROUTES WITH THE OWNER.
29. CONTRACTOR TO COORDINATE ELECTRICAL, LIGHTING, GAS AND ANY OTHER SERVICES REQUIRED FOR BUILDING USE WITH CORRESPONDING UTILITY OWNERS.

DIG TESS: 1-800-344-8377

Texas811 Know what's below. Call before you dig.

SURVEY CONTROL POINT 1

DESCRIPTION	Northing	Easting
IRF	16605233.08	1087889.41

SURVEY CONTROL POINT 2

DESCRIPTION	Northing	Easting
IRF	16605855.62	1087982.66

SURVEY CONTROL POINT 3

DESCRIPTION	Northing	Easting
IRF	16605710.72	1088949.73

SURVEY CONTROL POINT 4

DESCRIPTION	Northing	Easting
IRF	16605152.93	1088425.02

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

CITY OF PHARR AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C100
GENERAL NOTES & SURVEY CONTROL

H:\TWG19101-Pharr Aquatics Facility\DESIGN\DWG\01_TWG19101_GN.dwg Jun 07, 2019 - 2:09pm

Line Table		
Line #	Length	Direction
L1	6.22	N81° 28' 41.82"W
L2	87.59	S08° 31' 18.21"W
L3	23.00	S81° 28' 41.93"E
L4	23.00	N81° 28' 41.73"W
L5	7.00	S08° 30' 30.72"W
L6	15.50	S81° 28' 41.73"E
L7	370.00	S08° 31' 18.29"W
L8	15.50	N81° 28' 41.78"W
L9	1.50	S08° 31' 18.25"W
L10	23.00	S81° 28' 41.78"E
L11	15.81	N81° 28' 41.65"W
L12	17.80	S08° 31' 18.22"W
L13	32.27	N81° 28' 41.75"W
L14	17.80	N08° 31' 18.27"E
L15	4.00	N81° 28' 42.53"W
L16	15.50	S08° 31' 18.22"W
L17	567.50	N81° 28' 41.78"W
L18	29.50	N08° 31' 18.22"E
L19	15.50	N81° 28' 41.78"W
L20	136.00	N08° 31' 18.22"E

Line Table		
Line #	Length	Direction
L21	15.50	S81° 28' 41.78"E
L22	14.00	N08° 31' 18.22"E
L23	11.68	N81° 28' 41.78"W
L24	8.95	S08° 29' 46.86"W
L25	17.21	N81° 31' 38.97"W
L26	17.21	S81° 31' 38.97"E
L27	8.82	N08° 33' 57.58"E
L28	11.77	N81° 28' 41.78"W
L29	10.00	S08° 31' 18.22"W
L30	15.50	S81° 28' 41.78"E
L31	172.00	S08° 31' 18.22"W
L32	15.50	N81° 28' 41.78"W
L33	42.00	S08° 31' 18.22"W
L34	541.41	N81° 28' 41.78"W
L35	15.49	N08° 31' 18.22"E
L36	87.92	S08° 31' 18.22"W
L37	6.77	S81° 28' 41.77"E
L38	8.56	N81° 28' 41.71"W
L39	35.50	N08° 31' 18.26"E
L40	8.56	S81° 28' 41.71"E

Line Table		
Line #	Length	Direction
L41	31.50	S08° 31' 18.26"W
L42	23.68	S53° 31' 18.22"W
L43	1.74	N08° 31' 18.22"E
L44	1.74	S81° 28' 41.78"E
L45	3.10	N81° 28' 41.78"W
L46	25.59	N53° 31' 18.22"E
L47	3.10	S08° 31' 18.22"W
L48	31.50	S81° 28' 41.77"E
L49	10.00	S08° 31' 37.16"W
L50	35.50	N81° 28' 41.77"W
L51	10.00	N08° 31' 37.16"E
L52	4.17	S81° 28' 41.77"E
L53	124.67	N08° 31' 12.41"E
L54	124.67	S08° 31' 12.41"W
L55	4.17	N81° 28' 45.88"W
L56	35.50	S81° 28' 41.77"E
L57	66.00	S08° 31' 24.99"W
L58	35.50	N81° 28' 41.77"W
L59	66.00	N08° 31' 24.99"E
L60	4.17	N81° 28' 45.88"W

Line Table		
Line #	Length	Direction
L61	169.67	N08° 31' 14.15"E
L62	169.67	S08° 31' 14.15"W
L63	4.17	S81° 28' 41.77"E
L64	35.50	N81° 28' 41.74"W
L65	9.50	N08° 31' 18.25"E
L66	31.50	S81° 28' 41.74"E
L67	9.50	S08° 31' 18.25"W
L68	11.39	S81° 28' 41.78"E
L69	31.50	S08° 31' 18.23"W
L70	11.39	N81° 28' 41.78"W
L71	35.50	N08° 31' 18.23"E
L72	4.17	N08° 31' 18.22"E
L73	160.28	N81° 28' 41.78"W
L74	160.28	S81° 28' 41.78"E
L75	4.17	S08° 31' 18.26"W
L76	3.50	N81° 28' 41.73"W
L77	35.50	N08° 31' 18.26"E
L78	3.50	S81° 28' 41.73"E
L79	31.50	S08° 31' 18.26"W
L80	3.50	S81° 28' 41.78"E

Line Table		
Line #	Length	Direction
L81	31.50	S08° 31' 18.23"W
L82	3.50	N81° 28' 41.78"W
L83	35.50	N08° 31' 18.23"E
L84	4.17	S08° 31' 18.23"W
L85	205.67	S81° 28' 41.78"E
L86	205.67	N81° 28' 41.78"W
L87	4.17	N08° 31' 18.26"E

Curve Table			
Curve #	Length	Radius	Delta
C1	1.80	25.00	004.12
C2	15.71	10.00	090.00
C3	15.71	10.00	090.00
C4	3.93	2.50	090.00
C5	3.93	2.50	090.00
C6	15.71	10.00	090.00
C7	3.93	2.50	090.00
C8	3.93	2.50	090.00
C9	3.93	2.50	090.00
C10	3.93	2.50	090.00
C11	3.93	2.50	090.00
C12	22.78	14.50	090.00
C13	17.15	30.00	032.75
C14	14.14	4.50	180.00
C15	14.14	4.50	180.00
C16	16.99	30.00	032.45
C17	22.78	14.50	090.00
C18	3.93	2.50	090.00
C19	3.93	2.50	090.00
C20	4.04	2.50	092.68
C21	14.48	9.50	087.32
C22	1.96	25.00	004.50
C23	3.93	2.50	090.00
C24	3.93	2.50	090.00
C25	7.07	4.50	090.00

Curve Table			
Curve #	Length	Radius	Delta
C26	7.07	4.50	090.00
C27	22.38	9.50	135.00
C28	38.48	24.50	090.00
C29	22.38	9.50	135.00
C30	38.48	24.50	090.00
C31	22.38	9.50	135.00
C32	22.38	9.50	135.00
C33	7.07	4.50	090.00
C34	3.93	2.50	090.00
C35	3.93	2.50	090.00
C36	7.07	4.50	090.00
C37	3.93	2.50	090.00
C38	3.93	2.50	090.00
C39	3.93	2.50	090.00
C40	3.93	2.50	090.00
C41	3.93	2.50	090.00
C42	7.07	4.50	090.00
C43	7.07	4.50	090.00
C44	3.93	2.50	090.00
C45	7.07	4.50	090.00
C46	7.07	4.50	090.00
C47	3.93	2.50	090.00
C48	3.93	2.50	090.00
C49	3.93	2.50	090.00
C50	3.93	2.50	090.00

Curve Table			
Curve #	Length	Radius	Delta
C51	7.07	4.50	090.00
C52	7.07	4.50	090.00
C53	7.07	4.50	090.00
C54	7.07	4.50	090.00
C55	3.93	2.50	090.00
C56	3.93	2.50	090.00

NOTE:

LINES L7, L17 AND L34 ARE ALL TO BE EDGE CURB. (REFER TO DETAILS 3/C111 & 4/C111)

LEGEND

- = IRON ROD FOUND
- = IRON ROD SET
- = TRAFFIC LIGHT
- = POWER POLE
- = GUY WIRE
- = WATER METER
- = WATER VALVE
- = FIRE HYDRANT
- = WATER SERVICE
- = SIGN
- = TELEPHONE SIGN
- = TELEPHONE BOX
- = TELEPHONE PEDESTAL
- = IRRIGATION STAND PIPE
- = TYPE 'A' INLET
- = GRATED INLET
- = STORM MANHOLE
- = SANITARY MANHOLE
- WL = WATER LINE
- SD = STORM LINE
- SS = SANITARY LINE
- TEL = TELEPHONE LINE
- FO = FIBER OPTIC LINE
- = PROPOSED HEAVY DUTY ASPHALT PAVEMENT
- = PROPOSED LIGHT DUTY ASPHALT PAVEMENT
- = PROPOSED CONCRETE PAVEMENT
- = PROPOSED SIDEWALK

N

40 0 40
Scale 1" = 40'

(TRACT 1)
7.04 ACRES

S 08°31'18" W 505.62'

EXIST. STM. MH
TOP=105.12
FL=95.92 (24" N&S)
FL=98.23 (18" W)
FL=98.86 (18" E)

EXIST. CURB INLET
TOP=105.77
FL=101.02

EXIST. CURB INLET
TOP=105.50
FL=99.29

EXIST. SS MH
TOP=105.74
FL=101.94

EXIST. STM. MH
TOP=105.67
FL=96.54 (24" N&S)
FL=97.43 (24" E)

EXIST. CURB INLET
TOP=106.38
FL=101.80

EXIST. CURB INLET
TOP=106.02
FL=100.12

EXIST. STM. MH
TOP=105.90
FL=96.50 (24" N&S)
FL=98.82 (18" W)
FL=99.23 (18" W)

EXIST. SS MH
TOP=106.09
FL=97.95

EXIST. CURB INLET
TOP=106.27
FL=102.01

EXIST. CURB INLET
TOP=105.50
FL=99.55

EXIST. SS MH
TOP=105.84
FL=99.91

EXIST. STM. MH
TOP=106.01
FL=97.01 (24" N&S)
FL=99.31 (18" E&W)

N 08°31'18" E 885.84'

LOT 134

30.00' H.C.I.D. No.2
EASEMENT

LOT 133

LOT 2
(10.96 AC.)

S 81°28'42" E 297.86'

S 81°28'42" E 680.00'

LOT 133
KELLEY-PHARR SUBDIVISION
VOL. 3, PGS. 133-134, H.C.M.R.

15.00' UTILITY
EASEMENT

FREIGHTLINER PROPERTIES PHARR, LLC,
A TEXAS LIMITED LIABILITY COMPANY
(DOCUMENT No.2952207, H.C.D.R.)

VAUGHAN SUBDIVISION
(VOL31, PG.95B, H.C.D.R.)

15.00' UTILITY
EASEMENT

15.00' UTILITY
EASEMENT

EXIST. SS MH
TOP=106.09
FL=99.16 (8" W&S)

EXIST. CURB INLET
TOP=105.94
FL=101.07 (24" E)

S 08°33'58" W
555.59'

DETENTION SWALE

DETENTION SWALE

PROP. 15.00'
WL EASEMENT

N 08°31'18" E 609.38'

DETENTION SWALE

LAYOUT CONTROL
POINT

FF=109.50
LOT 1
(9.37 AC.)

DETENTION POND

DETENTION POND

10.00' H.C.I.D. No.2 EASEMENT
(REMAINING OF ORIGINAL 30')

24" SOLID WHITE
WITH 6" BLACK
BORDER STOPLINE

24" SOLID WHITE
WITH 6" BLACK
BORDER STOPLINE

EXIST. SS MH
TOP=106.55
FL=97.80 (8" N&S)

EXIST. CURB INLET
TOP=105.86
FL=99.16 (24" E)

U.S. EXPRESSWAY 281 (I-69C)
(R.O.W. VARIES)
(VOL. 1660, PG. 131, H.C.D.R.))

S 45°30'20" W 23.58'

N 81°32'05" W 140.21'

EXIST. STM. MH
TOP=107.15
FL=99.58 (24" W)
FL=94.88 (24" N&S)

S 86°37'31" W 93.88'

N 89°17'34" W 113.76'

N 81°28'42" W 320.62'

N 81°28'42" W 488.43'

S.W. CORNER
LOT 133
S.E. CORNER
LOT 134

EXIST. STM. MH
TOP=106.13
FL=97.47 (24")
FL=100.30 (18")

EXIST. CURB INLET
TOP=106.80
FL=101.35 (18" E&W)
FL=101.64 (18" S)

EXIST. GRATE INLET
TOP=105.51
FL=102.33

EXIST. CURB INLET
TOP=106.13
FL=103.68

EXIST. SS MH
TOP=106.38
FL=83.13 (24" E&W)
FL=97.60 (8" N)
FL=100.58 (8" S)
FL=84.41 (8" S)

EXIST. GRATE INLET
TOP=106.32
FL=100.33

EXIST. GRATE INLET
TOP=106.29
FL=104.22

EXIST. SS MH
TOP=106.88
FL=83.21

EXIST. GRATE INLET
TOP=106.65
FL=103.68

EXIST. GRATE INLET
TOP=106.66
FL=103.76

EXIST. CURB INLET
TOP=106.93
FL=103.30

EXIST. CURB INLET
TOP=105.36
FL=99.86 (18" W)
FL=100.21 (18" S)
FL=100.21 (24" E)

W. SIOUX ROAD

EXIST. SS MH
TOP=105.83
FL=82.85

EXIST. CURB INLET
TOP=105.34
FL=100.49

EXIST. SS MH
TOP=106.91
FL=92.41 (15"/24" E&W)
FL=95.30 (8" N&S)
FL=96.17 (8" N)
FL=93.20 (8" S)

H:\TWG19101-Pharr Aquatics Facility\DESIGN\DWG\01_TWG19101_DC.dwg Jun 07, 2019 - 2:10pm

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE
Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

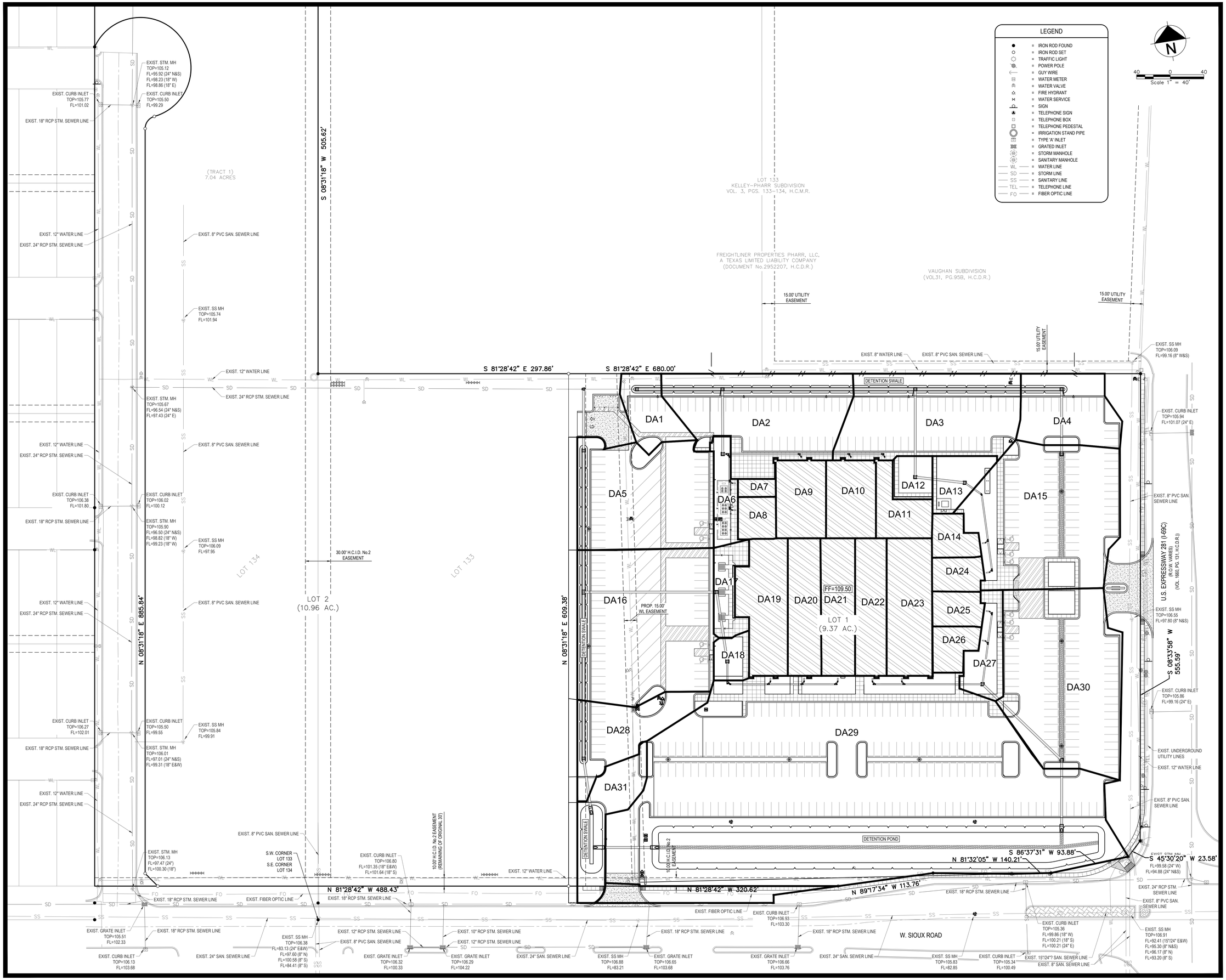
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C101
DIMENSION
CONTROL & SIGNAGE
PLAN



H:\TWG19101-Phar Aquatics Facility\DESIGN\DWG\01_TWG19101_DA.dwg Jun 07, 2019 - 2:10pm

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

CITY OF PHARR AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C102
DRAINAGE AREA MAP

DRAINAGE CALCULATIONS

PIPE DESIGN CALCULATIONS

PIPE	STRUCTURE		AREA		RUNOFF COEFFICIENT			TIME								PIPE DESIGN								HGL RESULTS			
NO.	NO.	TYPE	Incr.Area	TotalArea	RunoffCoeff	IncrC x A	TotalC x A	InletTime	TimeConc	Rnfallint	TotalRunoff	AdnlFlow	TotalFlow	CapacFull	Veloc	LineLength	PipeSize	Type	n	PipeSlope	Inv ElevDn	Inv ElevUp	HGLDn	HGLUp	Grnd/RimDn	Grnd/RimUp
			(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft)	(in)			(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
	2	OUTFALL																									
1			0.5	6.22	0.76	0.38	4.42	10	24.6	6.9	30.59	0	30.59	17.46	5.74	72.996	36	RCP	0.013	0.07	101.31	101.36	103.27	103.67	106.4	105.44
	8	GRATE																									
2			0.7	5.72	0.8	0.56	4.04	10	24	7	28.3	0	28.3	17.81	4	168.27	36	RCP	0.013	0.07	101.36	101.48	104.36	104.66	105.44	105.44
	9	GRATE																									
3			0.24	4.39	0.67	0.16	2.96	10	23	7.2	21.15	0	21.15	17.75	2.99	197.73	36	RCP	0.013	0.07	101.48	101.62	105.15	105.35	105.44	105.44
	10	GRATE																									
4			0.2	4.15	0.45	0.09	2.8	10	22.7	7.2	20.14	0	20.14	18.19	2.85	67.179	36	RCP	0.013	0.07	101.62	101.67	105.43	105.49	105.44	107.04
	11	GRATE																									
*5			0	3.95	0	0	2.71	0	22.5	7.2	19.57	0	19.57	77.33	2.77	39.419	36	RCP	0.013	1.34	101.67	102.2	105.56	105.59	107.04	107.28
	12	MH																									
6			2.75	3.95	0.62	1.71	2.71	10	22.1	7.3	19.74	0	19.74	40.6	2.79	78.25	36	RCP	0.013	0.37	102.2	102.49	105.77	105.84	107.28	107.57
	13	GRATE																									
*7			0	1.2	0	0	1	0	16.2	8.4	8.43	0	8.43	21.12	1.19	478.571	36	RCP	0.013	0.1	102.49	102.97	106	106.08	107.57	106.86
	14	MH																									
*8			0	1.2	0	0	1	0	16	8.5	8.47	0	8.47	17.83	1.2	16.8	36	RCP	0.013	0.07	102.97	102.98	106.11	106.11	106.86	108.06
	15	GRATE																									
9			0.64	1.2	0.85	0.54	1	10	14.9	8.7	8.71	0	8.71	17.62	1.23	86	36	RCP	0.013	0.07	102.98	103.04	106.12	106.14	108.06	107.12
	16	GRATE																									
10			0.1	0.56	0.42	0.04	0.46	10	11.5	9.6	4.39	0	4.39	17.54	0.62	130.169	36	RCP	0.013	0.07	103.04	103.13	106.18	106.19	107.12	108.89
	17	GRATE																									
11			0	0.34	0	0	0.31	0	10.4	9.9	3.04	0	3.04	2.54	3.88	93	12	PVC	0.01	0.3	103.13	103.41	106.2	106.6	108.89	104.43
	58	BEND																									
12			0	0.14	0	0	0.13	0	10	10.1	1.27	0	1.27	2.54	1.61	35	12	PVC	0.01	0.3	103.41	103.52	106.97	106.99	104.43	104.47
	59	BEND																									
	17	GRATE																									
13			0	0.12	0	0	0.11	0	10.9	9.8	1.06	0	1.06	2.53	1.35	48.464	12	PVC	0.01	0.3	103.13	103.28	106.2	106.22	108.89	104.38
	64	BEND																									
14			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	2.53	0.69	35.395	12	PVC	0.01	0.3	103.28	103.38	106.26	106.27	104.38	104.42
	65	BEND																									
	59	BEND																									
15			0	0.14	0	0	0.13	0	10	10.1	1.27	0	1.27	1.11	3.64	4	8	PVC	0.01	0.5	103.52	103.54	107.02	107.05	104.47	104.14
	60	BEND																									
16			0.14	0.14	0.9	0.13	0.13	10	10	10.1	1.27	0	1.27	1.11	3.64	4	8	PVC	0.01	0.5	103.54	103.56	107.21	107.23	104.14	0
	61	BEND																									
	58	BEND																									
17			0	0.2	0	0	0.18	0	10	10.1	1.81	0	1.81	1.13	5.19	4.243	8	PVC	0.01	0.52	103.41	103.43	106.77	106.83	104.43	104.1
	62	BEND																									
18			0.2	0.2	0.9	0.18	0.18	10	10	10.1	1.81	0	1.81	1.11	5.2	4	8	PVC	0.01	0.5	103.43	103.45	107.15	107.2	104.1	0
	63	BEND																									
	65	BEND																									
19			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	0.63	2.77	4.243	6	PVC	0.01	0.75	103.38	103.41	106.28	106.3	104.42	103.91
	66	BEND																									
20			0.06	0.06	0.9	0.05	0.05	10	10	10.1	0.54	0	0.54	0.63	2.77	4	6	PVC	0.01	0.75	103.41	103.44	106.39	106.41	103.91	0
	67	BEND																									
	64	BEND																									
21			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	0.64	2.77	4.243	6	PVC	0.01	0.78	103.28	103.31	106.24	106.27	104.38	103.87
	68	BEND																									
22			0.06	0.06	0.9	0.05	0.05	10	10	10.1	0.54	0	0.54	0.63	2.77	4	6	PVC	0.01	0.75	103.31	103.34	106.36	106.38	103.87	0
	69	BEND																									
	9	GRATE																									
23			0.08	0.63	0.61	0.05	0.52	10	12.2	9.4	4.89	0	4.89	12.2	1	158.33	30	RCP	0.013	0.09	101.35	101.49	105.27	105.29	105.44	108.81
	21	GRATE																									
24			0.05	0.55	0.42	0.02	0.47	10	11.3	9.7	4.56	0	4.56	7.83	1.45	83.436	24	RCP	0.013	0.12	102.45	102.55	105.32	105.35	108.81	108.98
	22	GRATE																									
25			0	0.5	0	0	0.45	0	11.2	9.7	4.37	0	4.37	3.83	3.56	24.032	15	PVC	0.01	0.21	102.62	102.67	105.37	105.43	108.98	103.66
	47	BEND																									
26			0	0.5	0	0	0.45	0	11.1	9.7	4.37	0	4.37	4.08	3.56	4.243	15	PVC	0.01	0.24	102.67	102.68	105.58	105.59	103.66	103.67
	48	BEND																									
27			0	0.5	0	0	0.45	0	10.9	9.8	4.4	0	4.4	4.14	3.59	45.28	15	PVC	0.01	0.24	102.68	102.79	105.74	105.86	103.67	103.81
	49	BEND																									
28			0	0.3	0	0	0.27	0	10.6	9.9	2.67	0	2.67	3.98	2.17	40	15	PVC	0.01	0.22	102.79	102.88	106.14	106.18	103.81	103.93
	50	BEND																									
29			0	0.15	0	0	0.14	0	10	10.1	1.36	0	1.36	3.98	1.11	40	15	PVC	0.01	0.23	102.88	102.97	106.29	106.3	103.93	104.05
	51	BEND																									
30			0	0.15	0	0	0.14	0	10	10.1	1.36	0	1.36	1.08	3.9	4.243	8	PVC	0.01	0.47	102.97	102.99	106.32	106.35	104.05	103.72
	52	BEND																									
31			0.15	0.15	0.9	0.14	0.14	10	10	10.1	1.36	0	1.36	1.11	3.9	4	8	PVC	0.01	0.5	102.99	103.01	106.52	106.55	103.72	0
	53	BEND																									
	50	BEND																									
32			0	0.15	0	0	0.14	0	10	10.1	1.36	0	1.36	1.08	3.9	4.243	8	PVC	0.01	0.47	102.85	102.87	106.24	106.27	103.93	103.6
	54	BEND																									
33			0.15	0.15	0.9	0.14	0.14	10	10	10.1	1.36	0	1.36	1.11	3.9	4	8	PVC	0.01	0.5	102.83	102.85	106.45	106.48	103.6	0
	55	BEND																									
	49	BEND																									
34			0	0.2	0	0	0.18	0	10	10.1	1.81	0	1.81	1.08	5.19	4.243	8	PVC	0.01	0.47	102.79	102.81	106.01	106.07	103.81	103.48
	56	BEND																									
35			0.2	0.2	0.9	0.18	0.18	10	10	10.1	1.81	0	1.81	1.11	5.2	4	8	PVC	0.01	0.5	102.81	102.83	106.39	106.44	103.48	0
	57	BEND																									

PIPE DESIGN CALCULATIONS

PIPE	STRUCTURE		AREA		RUNOFF COEFFICIENT			TIME								PIPE DESIGN								HGL RESULTS			
NO.	NO.	TYPE	Incr.Area	TotalArea	RunoffCoeff	IncrC x A	TotalC x A	InletTime	TimeConc	Rnfallint	TotalRunoff	AdnlFlow	TotalFlow	CapacFull	Veloc	LineLength	PipeSize	Type	n	PipeSlope	Inv ElevDn	Inv ElevUp	HGLDn	HGLUp	Grnd/RimDn	Grnd/RimUp
			(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft)	(in)			(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
	3	OUTFALL																									
36			0.47	2.56	0.69	0.32	1.86	10	20.5	7.6	14.08	0	14.08	17.51	1.99	101.589	36	RCP	0.013	0.07	102.31	102.38	105.37	105.38	106.21	106.53
	4	GRATE																									
37			0.47	1.59	0.71	0.33	1.13	10	18	8	9.07	0	9.07	17.62	1.28	229.211	36	RCP	0.013	0.07	102.38	102.54	105.51	105.54	106.53	106.53
	5	GRATE																									
38			0.22	0.86	0.65	0.14	0.64	10	10.8	9.8	6.31	0	6.31	17.52	0.89	173.989	36	RCP	0.013	0.07	102.54	102.66	105.59	105.61	106.53	106.53
	6	GRATE																									
39			0.64	0.64	0.78	0.5	0.5	10	10	10.1	5.03	0	5.03	8.14	1.6	77.167	24	RCP	0.013	0.13	102.66	102.76	105.62	105.66	106.53	107.12
	7	GRATE																									
	5	GRATE																									
40			0.06	0.26	0.33	0.02	0.15	10	14.3	8.9	1.34	0	1.34	7.98	0.43	104.475	24	RCP	0.013	0.12	102.7	102.83	105.6	105.6	106.53	109.09
	19	GRATE																									
41			0.08	0.2	0.29	0.02	0.13	10	11.9	9.5	1.25	0	1.25	7.78	0.4	59.124	24	RCP	0.013	0.12	102.83	102.9	105.61	105.61	109.09	110.53
	20	GRATE																									
	4	GRATE																									
42			0.08	0.5	0.36	0.03	0.41	10	12.2	9.4	3.83	0	3.83	7.73	1.22	77.001	24	RCP	0.013	0.12	102.43	102.52	105.51	105.53	106.53	108.57
	18	GRATE																									
	20	GRATE																									
43			0	0.12	0	0	0.11	0	11.6	9.6	1.04	0	1.04	2.48	1.32	24.44	12	PVC	0.01	0.29	102.9	102.97	105.61	105.63	110.53	104.05
	40	BEND																									
44			0	0.12	0	0	0.11	0	10.9	9.8	1.06	0	1.06	2.5	1.35	54.811	12	PVC	0.01	0.29	102.97	103.13	105.65	105.68	104.05	104.21
	41	BEND																									
45			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	2.59	0.69	35.26	12	PVC	0.01	0.31	103.13	103.24	105.72	105.72	104.21	104.32
	42	BEND																									
	18	GRATE																									
46			0	0.42	0	0	0.38	0	12.2	9.4	3.56	0	3.56	2.43	4.53	5.03	12	PVC	0.01	0.4	102.52	102.54	105.57	105.61	108.57	103.62
	23	BEND																									
47			0	0.35	0	0	0.32	0	11.7	9.6	3.01	0	3.01	4.06	2.46	81.385	15	PVC	0.01	0.23	102.54	102.73	106.08	106.18	103.62	103.87
	24	BEND																									
48			0	0.22	0	0	0.2	0	11	9.8	1.93	0	1.93	4.01	1.58	65.667	15	PVC	0.01	0.23	102.73	102.88	106.31	106.34	103.87	104.07
	25	BEND																									
49			0	0.09	0	0	0.08	0	10	10.1	0.82	0	0.82	4.12	0.66	37.417	15	PVC	0.01	0.24	102.88	102.97	106.4	106.41	104.07	104.18
	26	BEND																									
	42	BEND																									
50			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	0.61	2.77	4.243	6	PVC	0.01	0.71	103.24	103.27	105.73	105.75	104.32	103.81
	43	BEND																									
51			0.06	0.06	0.9	0.05	0.05	10	10	10.1	0.54	0	0.54	0.53	2.77	4	6	PVC	0.01	0.75	103.27	103.3	105.84	105.87	103.81	0
	44	BEND																									
	26	BEND																									
52			0	0.09	0	0	0.08	0	10	10.1	0.82	0	0.82	1.08	2.34	4.243	8	PVC	0.01	0.47	102.97	102.99	106.41	106.42	104.18	103.85
	27	BEND																									
53			0.09	0.09	0.9	0.08	0.08	10	10	10.1	0.82	0	0.82	0.93	2.34	2	8	PVC	0.01	0.5	102.99	103	106.49	106.49	103.85	0
	28	BEND																									
	41	BEND																									
54			0	0.06	0	0	0.05	0	10	10.1	0.54	0	0.54	0.62	2.77	4.149	6	PVC	0.01	0.72	103.13	103.16	105.7	105.72	104.21	103.7
	45	BEND																									
55			0.06	0.06	0.9	0.05	0.05	10	10	10.1	0.54	0	0.54	0.63	2.77	4	6	PVC	0.01	0.75	103.16	103.19	105.81	105.83	103.7	0
	46	BEND																									
	25	BEND																									
56			0	0.13	0	0	0.12	0	10	10.1	1.18	0	1.18	1.08	3.38	4.243	8	PVC	0.01	0.47	102.88	102.9	106.37	106.39	104.07	103.74
	29	BEND																									
57			0.13	0.13	0.9	0.12	0.12	10	10	10.1	1.18	0	1.18	1.25	3.38	1.574	8	PVC	0.01	0.64	102.9	102.91	106.53	106.54	103.74	0
	30	BEND																									
	18	BEND																									
58			0	0.07	0	0	0.06	0	11.6	9.6	0.6	0	0.6	2.25	0.77	4.243	12	PVC	0.01	0.24	102.54	102.55	106.16	106.16	103.62	103.63
	33	BEND																									
59			0	0.07	0	0	0.06	0	11	9.8	0.62	0	0.62	2.73	0.78	28.719	12	PVC	0.01	0.35	102.55	102.65	106.17	106.17	103.63	103.73
	34	BEND																									
60			0	0.05	0	0	0.05	0	10.1	10.1	0.45	0	0.45	2.58	0.58	32.078	12	PVC	0.01	0.31	102.65	102.75	106.18	106.19	103.73	103.83
	35	BEND																									
	24	BEND																									
61			0	0.13	0	0	0.12	0	10	10.1	1.18	0	1.18	1.08	3.38	4.243	8	PVC	0.01	0.47	102.73	102.75	106.25	106.27	103.87	103.54
	31	BEND																									
62			0.13	0.13	0.9	0.12	0.12	10	10	10.1	1.18	0	1.18	1.25	3.38	1.574	8	PVC	0.01	0.64	102.75	102.76	106.41	106.42	103.54	0
	32	BEND																									
	35	BEND																									
63			0	0.05	0	0	0.05	0	10	10.1	0.45	0	0.45	0.61	2.31	4.243	6	PVC	0.01	0.71	102.75	102.78	106.19	106.21	103.83	103.32
	36	BEND																									
64			0.05	0.05	0.9	0.05	0.05	10	10	10.1	0.45	0	0.45	0.63	2.31	4.003	6	PVC	0.01	0.75	102.78	102.81	106.27	106.29	103.32	0
	37	BEND																									
	34	BEND																									
65			0	0.02	0	0	0.02	0	10.1	10.1	0.18	0	0.18	0.61	0.92	4.243	6	PVC	0.01	0.71	102.65	102.68	106.18	106.18	103.73	103.22
	38	BEND																									
66			0.02	0.02	0.9	0.02	0.02	10	10	10.1	0.18	0	0.18	0.63	0.92	4	6	PVC	0.01	0.75	102.68	102.71	106.19	106.2	103.22	0
	39	BEND																									

*NOTES:

LINES 5, 7 AND 8 WERE IMPLEMENTED INTO THE DESIGN ANALYSIS TO PROPERLY DESIGN THE CONVEYENCE WITHOUT A FLOW DELAY CAUSED BY DETENTION.
OUTFALL AT THE DOWN STREAM OF LINE 1 IS IN ACTUALLITY THE JUNCTION WITH THE EXISTING 24" PIPE.
OUTFALL AT THE DOWN STREAM OF LINE 36 IS IN ACTUALLITY THE JUNCTION WITH THE EXISTING 24" PIPE.

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION | DATE | APPROVED BY | DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C103
DRAINAGE AREA CALCULATIONS

STORM SEWER STRUCTURE LIST	
STRUCTURE	STRUCTURE DETAILS
1	EXIST. 48" MANHOLE TOP = 105.64 N = 16605872.34 E = 1087761.74 INV = 97.43 E
2	STD. 48" MANHOLE TOP = 106.40 N = 16605790.55 E = 1088292.13 INV = 98.70 W INV = 101.06 S INV = 98.70 E
3	TYPE 'C' INLET TOP = 105.71 N = 16605781.13 E = 1088354.97 INV = 98.86 W INV = 102.31 E
4	TYPE 'C' INLET TOP = 106.03 N = 16605766.08 E = 1088455.44 INV = 102.43 W INV = 102.43 E INV = 102.43 S
5	TYPE 'C' INLET TOP = 106.03 N = 16605732.11 E = 1088682.12 INV = 102.70 W INV = 102.70 E INV = 102.70 S
6	TYPE 'C' INLET TOP = 106.03 N = 16605706.33 E = 1088854.18 INV = 102.91 W INV = 102.91 S

STORM SEWER STRUCTURE LIST	
STRUCTURE	STRUCTURE DETAILS
7	TYPE 'C' INLET TOP = 107.12 N = 16605630.02 E = 1088842.75 INV = 103.00 N
8	TYPE 'C' INLET TOP = 104.94 N = 16605718.36 E = 1088281.31 INV = 101.15 N INV = 101.15 S
9	TYPE 'C-C' INLET TOP = 104.94 N = 16605551.95 E = 1088256.38 INV = 101.36 N INV = 101.36 S INV = 101.36 E
10	TYPE 'C' INLET TOP = 104.94 N = 16605356.40 E = 1088227.08 INV = 101.59 N INV = 101.59 S
16	TYPE 'C' INLET TOP = 107.12 N = 16605270.36 E = 1088788.88 INV = 103.08 S INV = 103.08 NW
17	TYPE 'C' INLET TOP = 108.89 N = 16605373.35 E = 1088709.27 INV = 103.24 SE INV = 103.24 W INV = 103.24 N

STORM SEWER STRUCTURE LIST	
STRUCTURE	STRUCTURE DETAILS
18	TYPE 'C' INLET TOP = 108.57 N = 16605689.88 E = 1088444.33 INV = 102.79 N INV = 102.52 E
19	TYPE 'C' INLET TOP = 109.09 N = 16605628.79 E = 1088666.83 INV = 102.83 N INV = 102.83 E
20	TYPE 'C' INLET TOP = 109.01 N = 16605613.40 E = 1088723.72 INV = 102.90 W INV = 102.90 SE
21	TYPE 'C' INLET TOP = 108.81 N = 16605528.49 E = 1088412.96 INV = 101.55 W INV = 102.45 S
22	TYPE 'C' INLET TOP = 108.98 N = 16605445.05 E = 1088413.18 INV = 102.55 N

STORM SEWER PIPE LIST	
PIPE	PIPE DETAILS
1	73 L.F. - 24" RCP CLASS III @ 0.12%
2	168 L.F. - 24" RCP CLASS III @ 0.12%
3	198 L.F. - 24" RCP CLASS III @ 0.12%
4	67 L.F. - 24" RCP CLASS III @ 0.03%
6	78 L.F. - 24" RCP CLASS III @ 0.00%
9	86 L.F. - 24" RCP CLASS III @ 0.12%
10	130 L.F. - 24" RCP CLASS III @ 0.12%
23	158 L.F. - 24" RCP CLASS III @ 0.12%
24	83 L.F. - 24" RCP CLASS III @ 0.12%
36	102 L.F. - 24" RCP CLASS III @ 0.12%
37	229 L.F. - 24" RCP CLASS III @ 0.12%
38	174 L.F. - 24" RCP CLASS III @ 0.12%
39	77 L.F. - 24" RCP CLASS III @ 0.12%
40	104 L.F. - 24" RCP CLASS III @ 0.12%
41	59 L.F. - 24" RCP CLASS III @ 0.12%
42	77 L.F. - 24" RCP CLASS III @ 0.47%

LEGEND

- = IRON ROD FOUND
- = IRON ROD SET
- = TRAFFIC LIGHT
- = POWER POLE
- = GUY WIRE
- = WATER METER
- = WATER VALVE
- = FIRE HYDRANT
- = WATER SERVICE
- = SIGN
- = TELEPHONE SIGN
- = TELEPHONE BOX
- = TELEPHONE PEDESTAL
- = IRRIGATION STAND PIPE
- = TYPE 'A' INLET
- = GRATED INLET
- = STORM MANHOLE
- = SANITARY MANHOLE
- WL = WATER LINE
- SD = STORM LINE
- SS = SANITARY LINE
- TEL = TELEPHONE LINE
- FO = FIBER OPTIC LINE
- = PROPOSED HEAVY DUTY ASPHALT PAVEMENT
- = PROPOSED LIGHT DUTY ASPHALT PAVEMENT
- = PROPOSED CONCRETE PAVEMENT
- = PROPOSED SIDEWALK

N

40 0 40
Scale 1" = 40'

(TRACT 1)
7.04 ACRES

LOT 133
KELLEY–PHARR SUBDIVISION
VOL. 3, PGS. 133–134, H.C.M.R.

FREIGHTLINER PROPERTIES PHARR, LLC,
A TEXAS LIMITED LIABILITY COMPANY
(DOCUMENT No.2952207, H.C.D.R.)

VAUGHAN SUBDIVISION
(VOL.31, PG.95B, H.C.D.R.)

LOT 134

LOT 2
(10.96 AC.)

LOT 133

LOT 1
(9.37 AC.)

S 08°31'18" W 505.62'

N 08°31'18" E 885.84'

N 08°31'18" E 609.38'

S 08°33'58" W
555.59'

S 81°28'42" E 297.86'

S 81°28'42" E 680.00'

N 81°28'42" W 488.43'

N 81°28'42" W 320.62'

N 81°32'05" W 140.21'

N 89°17'34" W 113.76'

S 45°30'20" W 23.58'

S 86°37'31" W
93.88'

30.00' H.C.I.D. No.2
EASEMENT

10.00' H.C.I.D. No.2 EASEMENT
(REMAINING OF ORIGINAL 30')

15.00' UTILITY
EASEMENT

PROP. 15.00'
WL EASEMENT

DETENTION SWALE

DETENTION POND

FF=109.50

PROP. LIGHT POLE
INSIDE OF BIO-SWALE

24" S.E.T. (TYP.)

EXIST. STM. MH
TOP=105.12
FL=95.92 (24" N&S)
FL=98.23 (18" W)
FL=98.86 (18" E)

EXIST. CURB INLET
TOP=105.77
FL=101.02

EXIST. CURB INLET
TOP=105.50
FL=99.29

EXIST. 18" RCP STM. SEWER LINE

EXIST. 12" WATER LINE

EXIST. 24" RCP STM. SEWER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. SS MH
TOP=105.74
FL=101.94

EXIST. 12" WATER LINE

EXIST. STM. MH
TOP=105.67
FL=96.54 (24" N&S)
FL=97.43 (24" E)

EXIST. 24" RCP STM. SEWER LINE

EXIST. 12" WATER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. CURB INLET
TOP=106.38
FL=101.80

EXIST. CURB INLET
TOP=106.02
FL=100.12

EXIST. 18" RCP STM. SEWER LINE

EXIST. STM. MH
TOP=105.90
FL=96.50 (24" N&S)
FL=98.82 (18" W)
FL=99.23 (18" W)

EXIST. SS MH
TOP=106.09
FL=97.95

EXIST. 12" WATER LINE

EXIST. 24" RCP STM. SEWER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. CURB INLET
TOP=106.27
FL=102.01

EXIST. CURB INLET
TOP=105.50
FL=99.55

EXIST. SS MH
TOP=105.84
FL=99.91

EXIST. 18" RCP STM. SEWER LINE

EXIST. STM. MH
TOP=106.01
FL=97.01 (24" N&S)
FL=99.31 (18" E&W)

EXIST. 12" WATER LINE

EXIST. 24" RCP STM. SEWER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. STM. MH
TOP=106.13
FL=97.47 (24")
FL=100.30 (18")

EXIST. CURB INLET
TOP=106.80
FL=101.64 (18" S)

S.W. CORNER
LOT 133
S.E. CORNER
LOT 134

EXIST. 12" WATER LINE

EXIST. 18" RCP STM. SEWER LINE

EXIST. FIBER OPTIC LINE

EXIST. 18" RCP STM. SEWER LINE

EXIST. GRATE INLET
TOP=105.51
FL=102.33

EXIST. 18" RCP STM. SEWER LINE

EXIST. CURB INLET
TOP=106.13
FL=103.68

EXIST. 24" SAN. SEWER LINE

EXIST. SS MH
TOP=106.38
FL=83.13 (24" E&W)
FL=100.58 (8" S)
FL=84.41 (8" S)

EXIST. 12" RCP STM. SEWER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. GRATE INLET
TOP=106.32
FL=100.33

EXIST. 10" RCP STM. SEWER LINE

EXIST. 12" RCP STM. SEWER LINE

EXIST. GRATE INLET
TOP=106.29
FL=104.22

EXIST. 24" SAN. SEWER LINE

EXIST. SS MH
TOP=106.88
FL=83.21

EXIST. 18" RCP STM. SEWER LINE

EXIST. GRATE INLET
TOP=106.65
FL=103.68

EXIST. GRATE INLET
TOP=106.66
FL=103.76

EXIST. 18" RCP STM. SEWER LINE

EXIST. FIBER OPTIC LINE

EXIST. CURB INLET
TOP=106.93
FL=103.30

EXIST. 18" RCP STM. SEWER LINE

W. SIOUX ROAD

EXIST. 24" SAN. SEWER LINE

EXIST. SS MH
TOP=105.83
FL=82.85

EXIST. CURB INLET
TOP=105.34
FL=100.49

EXIST. CURB INLET
TOP=105.36
FL=99.86 (18" W)
FL=100.21 (18" S)
FL=100.21 (24" E)

EXIST. 15"/24"/3" SAN. SEWER LINE

EXIST. 8" SAN. SEWER LINE

EXIST. 8" WATER LINE

EXIST. 8" PVC SAN. SEWER LINE

EXIST. SS MH
TOP=106.09
FL=99.16 (8" W&S)

EXIST. CURB INLET
TOP=105.94
FL=101.07 (24" E)

EXIST. 8" PVC SAN.
SEWER LINE

EXIST. SS MH
TOP=106.55
FL=97.80 (8" N&S)

EXIST. CURB INLET
TOP=105.86
FL=99.16 (24" E)

EXIST. UNDERGROUND
UTILITY LINES

EXIST. 12" WATER LINE

EXIST. 8" PVC SAN.
SEWER LINE

EXIST. 24" RCP STM.
SEWER LINE

EXIST. 8" PVC SAN.
SEWER LINE

EXIST. SS MH
TOP=106.91
FL=92.41 (15"/24" E&W)
FL=95.30 (8" N&S)
FL=96.17 (8" N)
FL=93.20 (8" S)

U.S. EXPRESSWAY 281 (I-69C)
(R.O.W. VARIES)
(VOL. 1680, PG. 131, H.C.D.R.)

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
Jorge D. Perez, P.E.
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE
Pence Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

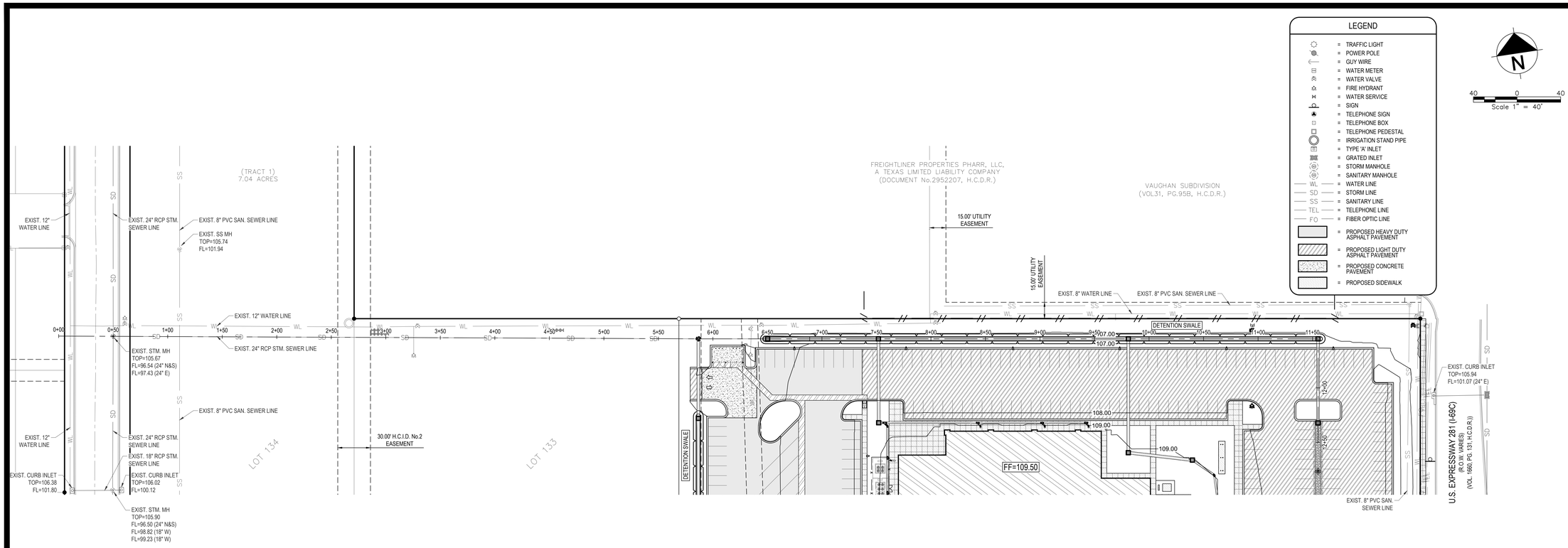
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

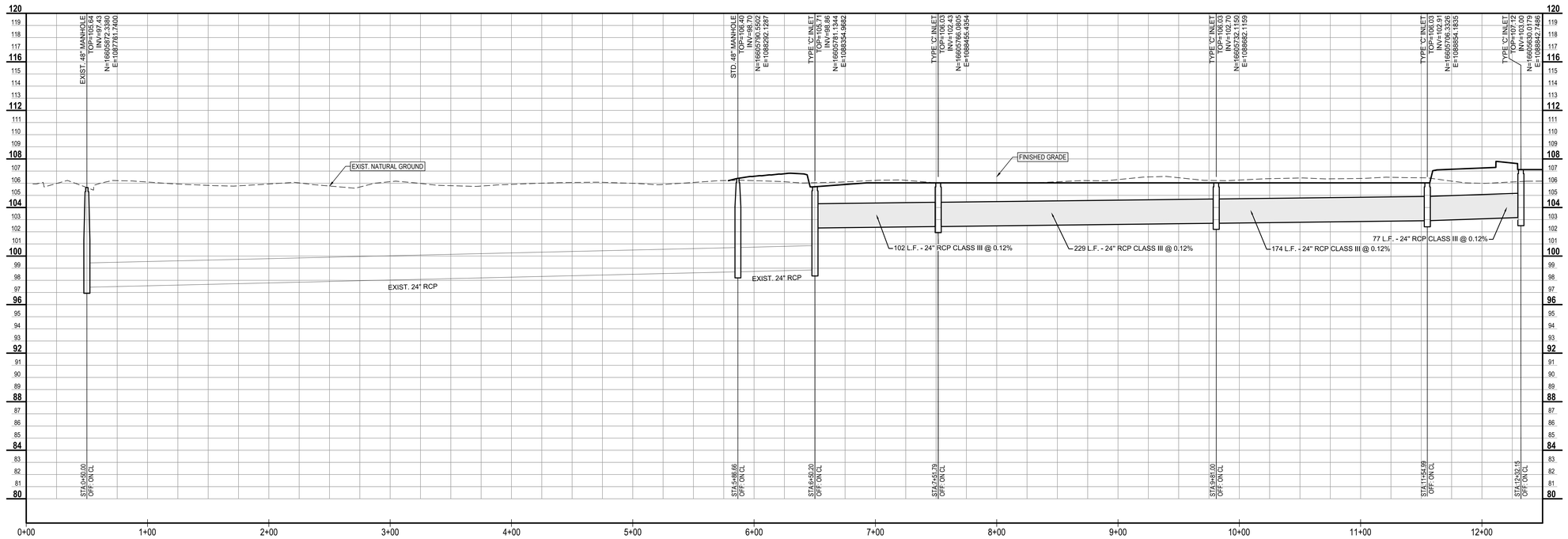
PROJECT 971805
DATE 6/07/2019
REVISED

C104
GRADING AND
DRAINAGE PLAN

H:\TWG1910\Phar Aquatics Facility\DESIGN\DWG\01_TWG19101_GD.dwg Jun 07, 2019 - 2:10pm



STORM SEWER LINE 'A' PROFILE
SCALE H: 1" = 40'
V: 1" = 4'



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE
Pierce Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

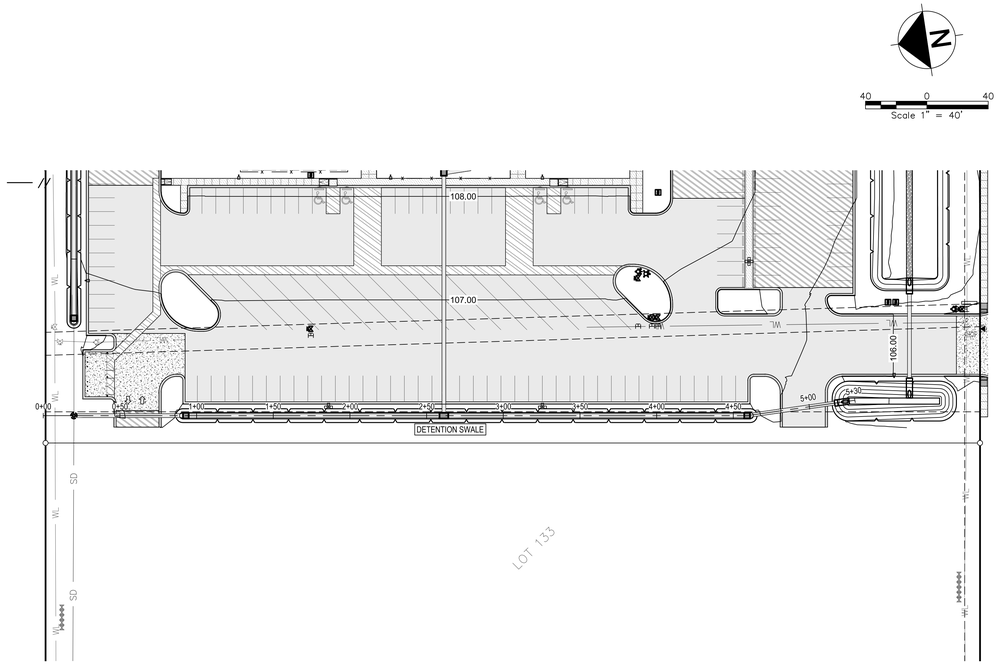
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

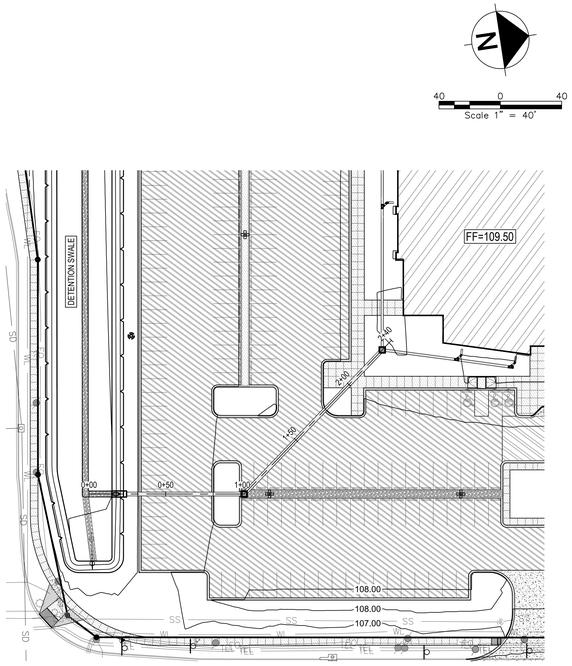
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C105
STORM SEWER LINE
'A'



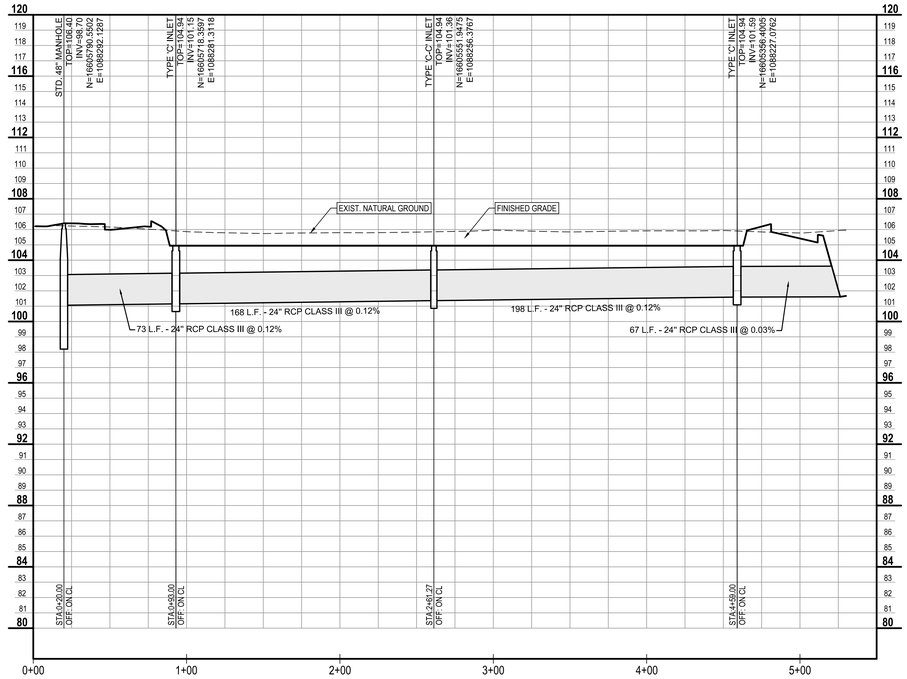
STORM SEWER LINE 'B' PROFILE
SCALE H: 1" = 40'
V: 1" = 4'

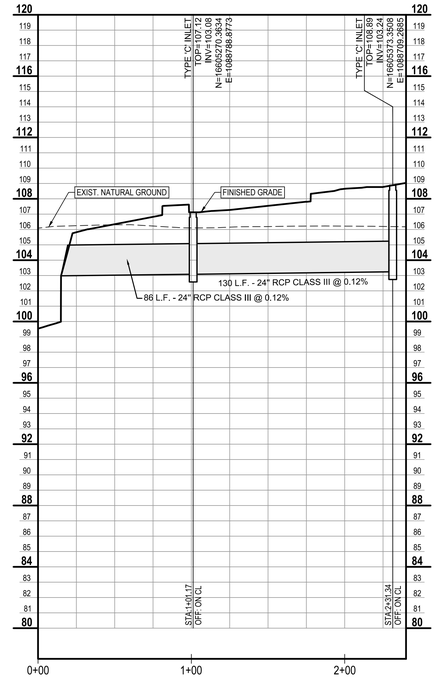


STORM SEWER LINE 'C' PROFILE
SCALE H: 1" = 40'
V: 1" = 4'

LEGEND

- TRAFFIC LIGHT
- POWER POLE
- GUY WIRE
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- WATER SERVICE
- SIGN
- TELEPHONE SIGN
- TELEPHONE BOX
- TELEPHONE PEDESTAL
- IRRIGATION STAND PIPE
- TYPE 'A' INLET
- GRATED INLET
- STORM MANHOLE
- SANITARY MANHOLE
- WL — WATER LINE
- SD — STORM LINE
- SS — SANITARY LINE
- TEL — TELEPHONE LINE
- FO — FIBER OPTIC LINE
- PROPOSED HEAVY DUTY ASPHALT PAVEMENT
- PROPOSED LIGHT DUTY ASPHALT PAVEMENT
- PROPOSED CONCRETE PAVEMENT
- PROPOSED SIDEWALK





THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
Jorge D. Perez, P.E.
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Parkes Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C106
STORM SEWER LINE
'B' & 'C'

KEYED NOTES:

[A] SANITARY SEWER SERVICE CONNECTIONS BY MASTER PLUMBER. CONNECT TO BUILDING SANITARY SEWER SERVICE LINE (VERIFY ELEVATION AND LOCATION FROM MEP PLAN). REFER TO SANITARY SEWER SERVICE DETAIL FOR CONNECTION.

[B] CONNECT WATERLINE (VERIFY ELEVATION AND LOCATION FROM MEP PLAN)

[C] ADJUST WATERLINE OVER STORM SEWER PIPE

[D] 4" BACKFLOW PREVENTER (SHT C115, DET. 6)

[E] 4" WATER METER ASSEMBLY (SHT C115, DET. 7)

FIRE INFRASTRUCTURE NOTES:

FIRE MAIN AND SYSTEM INSTALLATION:

THE DRAWINGS CONTAINED HEREIN REGARDING FIRE LINES AND RELATED APPURTENANCES ARE SHOWN AS A GENERAL GUIDE TO THE REGISTERED FIRE SUPPRESSION, FIRE SPRINKLER SYSTEM AND SERVICE INSTALLATION CONTRACTOR.

ALL WORK RELATED TO THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS, FIRE SUPPRESSION SYSTEMS AND RELATED APPURTENANCES ABOVE AND BELOW GROUND SHALL BE DESIGNED AND INSTALLED BY A REGISTERED FIRE SUPPRESSION CONTRACTOR IN THE STATE OF TEXAS AND MEETING THE LATEST TEXAS INSURANCE CODE CHAPTER 6003 AND OTHER APPLICABLE NATIONAL, STATE AND CITY CODES, RULES AND REGULATIONS AS APPROPRIATE.

GENERAL UTILITY NOTES:

1. WHEN CONNECTING TO PROPOSED SERVICE CONNECTIONS TO THE NEW BUILDING, THE CONTRACTOR SHALL PROVIDE ALL NECESSARY FITTINGS, ADAPTERS, REDUCERS, ETC. TO SUCCESSFULLY MAKE A WATERTIGHT CONNECTION TO THE STUB-OUTS PROVIDED BY THE MEP.
2. SEE PLUMBING PLANS FOR SERVICE LOCATIONS AND INVERT ELEVATIONS. ALL BUILDING CONNECTION LOCATIONS WHETHER SANITARY SEWER OR WATER LINES MUST BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.
3. WHERE APPLICABLE, ALL PAVEMENT REPAIR SHALL HAVE 12" OF CALICHE FOR FLEXIBLE BASE COMPACTED TO 98% STD. PROCTOR DENSITY AND 2" OF H.M.A.C. COMPACTED TO 92% OF MAX. SPECIFIC DENSITY AND MUST HAVE A SMOOTH TRANSITION BETWEEN EXISTING AND PROPOSED ASPHALT SURFACES. SEE TYPICAL DETAIL SHEETS OF THESE PLANS.
4. THE UNDERGROUND WATER SUPPLY LINE FOR THE BUILDING FIRE SPRINKLER SYSTEM MUST BE DESIGNED AND INSTALLED BY A LICENSED QUALIFIED CONTRACTOR FOR UNDERGROUND FIRE PROTECTION SYSTEM INSTALLATION.
5. REFER TO DETAILS FOR CONCRETE THRUST DETAIL FOR ALL BENDS.
6. ALL CAST IRON OR DUCTILE IRON FITTINGS SHALL BE COMPLETELY WRAPPED WITH 4 MIL POLY WRAP BEFORE INSTALLATION IN THE TRENCH.
7. THE CONTRACTOR SHALL SURVEY AND VERIFY SANITARY SEWER INVERT ELEVATIONS AT TIE-IN LOCATIONS AND PROVIDE ELEVATIONS TO THE ENGINEER PRIOR TO CONSTRUCTION. IN ADDITION, THE CONTRACTOR SHALL ALSO VERIFY THE LOCATIONS AND DEPTHS OF ALL POSSIBLE LINE AND GRADE CONFLICTS WITH THE CONSTRUCTION OF THE SANITARY SEWER SERVICE LINES.
8. EXTREME CARE SHALL BE TAKEN WHEN WORKING IN THE VICINITY OF EXISTING UTILITIES AND ANY DAMAGES TO FIBER OPTIC LINES, WATER LINES, STORM SEWERS , GAS LINES OR ANY OTHER PUBLIC OR PRIVATE UTILITY LINE OR FIXTURE(S) SHALL BE REPAIRED (OR REPLACED OF THE SAME TYPE) BY THE CONTRACTOR, AND SUCH COST SHALL BE PAID FOR BY THE CONTRACTOR AND CONSIDERED SUBSIDIARY TO THE PROJECT COST.
9. THE CONTRACTOR SHALL NOTE THAT THERE ARE EXISTING 12" WATER LINES, VALVES AND FIRE HYDRANTS IN THE PROJECT CONSTRUCTION AREA SITE , MAINLY LOCATED ALONG THE WEST PARKING AND SERVICE DRIVE AREA AND THE NORTH PROPERTY LINE. PLEASE REFER TO THE "SPECIAL PROJECT CONDITIONS" SECTION OF THE SPECIFICATIONS FOR HANDLING DIRECTIVES. THE CONTRACTOR SHALL VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF THESE LINES, AND THE ENGINEER SHALL BE ADVISED OF ANY POSSIBLE XYZ CONFLICTS WITH THE PROPOSED IMPROVEMENTS.
10. ALL WATER AND SANITARY SEWER APPURTANCES, VALVES, FIRE HYDRANTS, MANHOLES AND COVERS, CLEANOUTS, ETC. FOR THIS PROJECT, REGARDLESS IF THESE ARE ON OF OFF SITE SHALL BE OF THE TYPE, MATERIAL, CLASS, MODEL NUMBER, PAINT, ETC. AS PER THE CITY OF PHARR STANDARD TYPICAL DETAILS AND MATERIAL SUPPLY LISTS.

LEGEND

●	= IRON ROD FOUND
○	= IRON ROD SET
	= TRAFFIC LIGHT
	= POWER POLE
	= GUY WIRE
	= WATER METER
	= WATER VALVE
	= FIRE HYDRANT
	= WATER SERVICE
	= SIGN
	= TELEPHONE SIGN
	= TELEPHONE BOX
	= TELEPHONE PEDESTAL
	= IRRIGATION STAND PIPE
	= TYPE 'A' INLET
	= GRATED INLET
	= STORM MANHOLE
	= SANITARY MANHOLE
WL	= WATER LINE
SD	= STORM LINE
SS	= SANITARY LINE
TEL	= TELEPHONE LINE
FO	= FIBER OPTIC LINE
	= PROPOSED HEAVY DUTY ASPHALT PAVEMENT
	= PROPOSED LIGHT DUTY ASPHALT PAVEMENT
	= PROPOSED CONCRETE PAVEMENT
	= PROPOSED SIDEWALK

N

40 0 40
Scale 1" = 40'

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
94594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

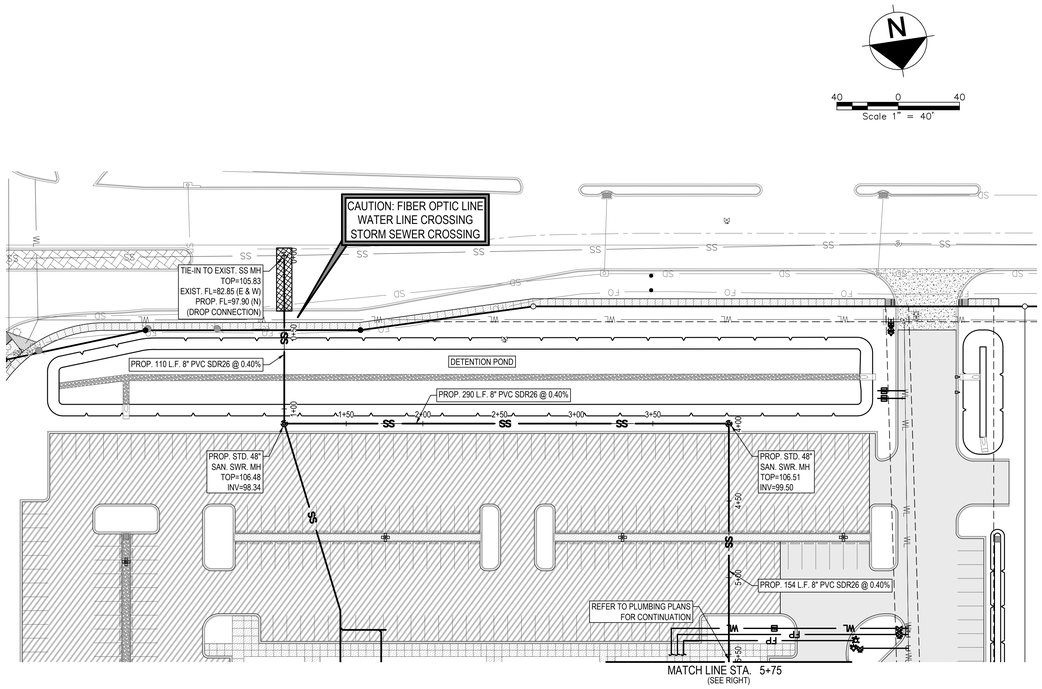
PROPOSED

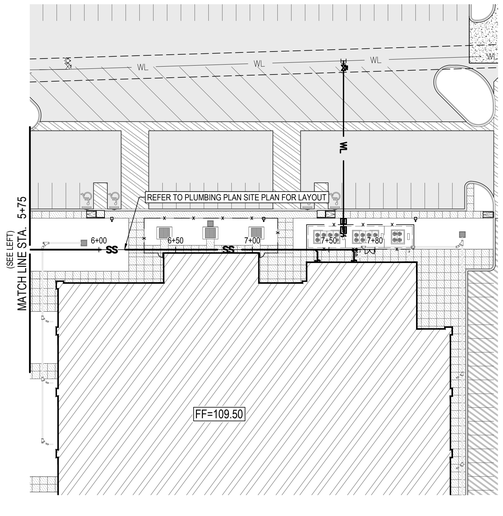
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	6/07/2019
REVISED	

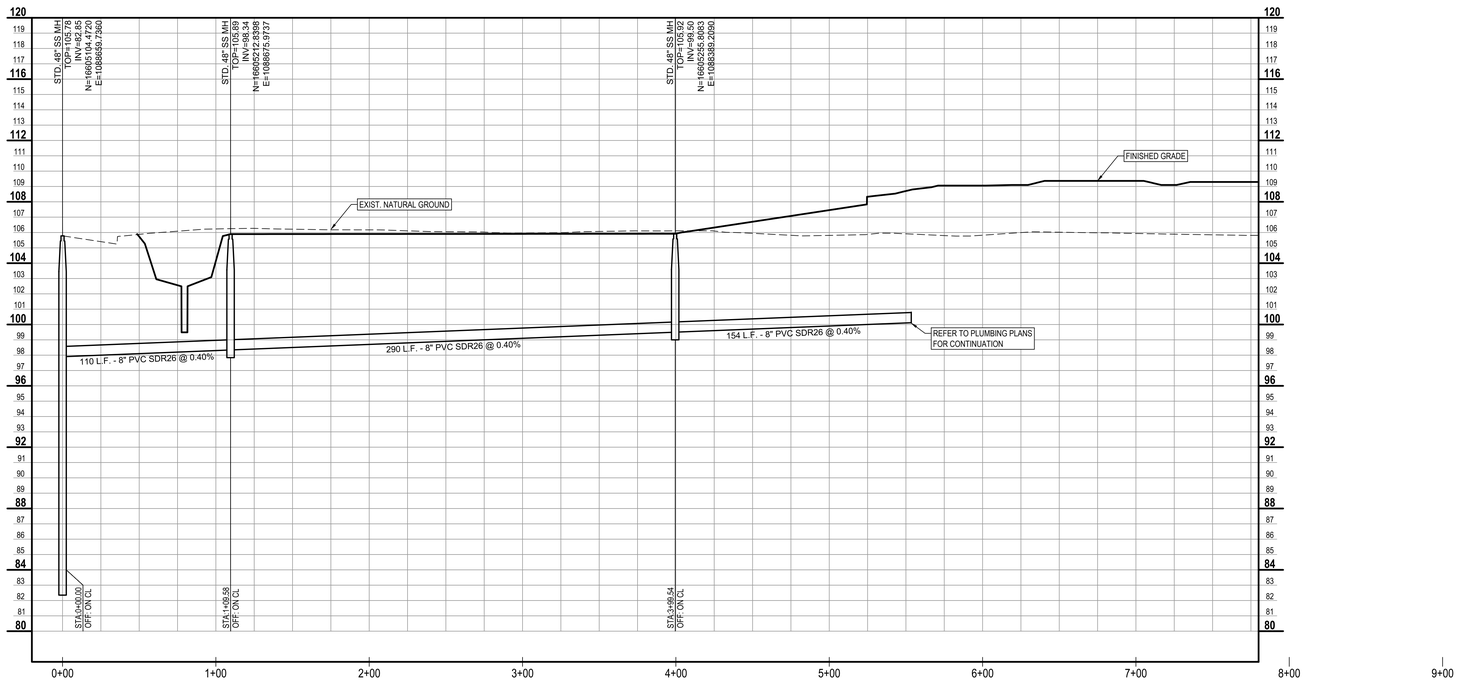
C107
WATER & WASTEWATER PLAN

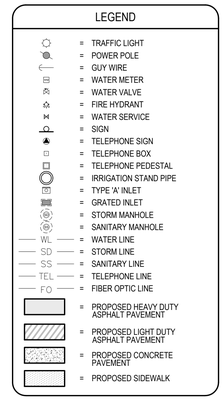




SANITARY SEWER LINE 'A' PROFILE

SCALE H: 1" = 40'
V: 1" = 4'





THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
4/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE
Pierce Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

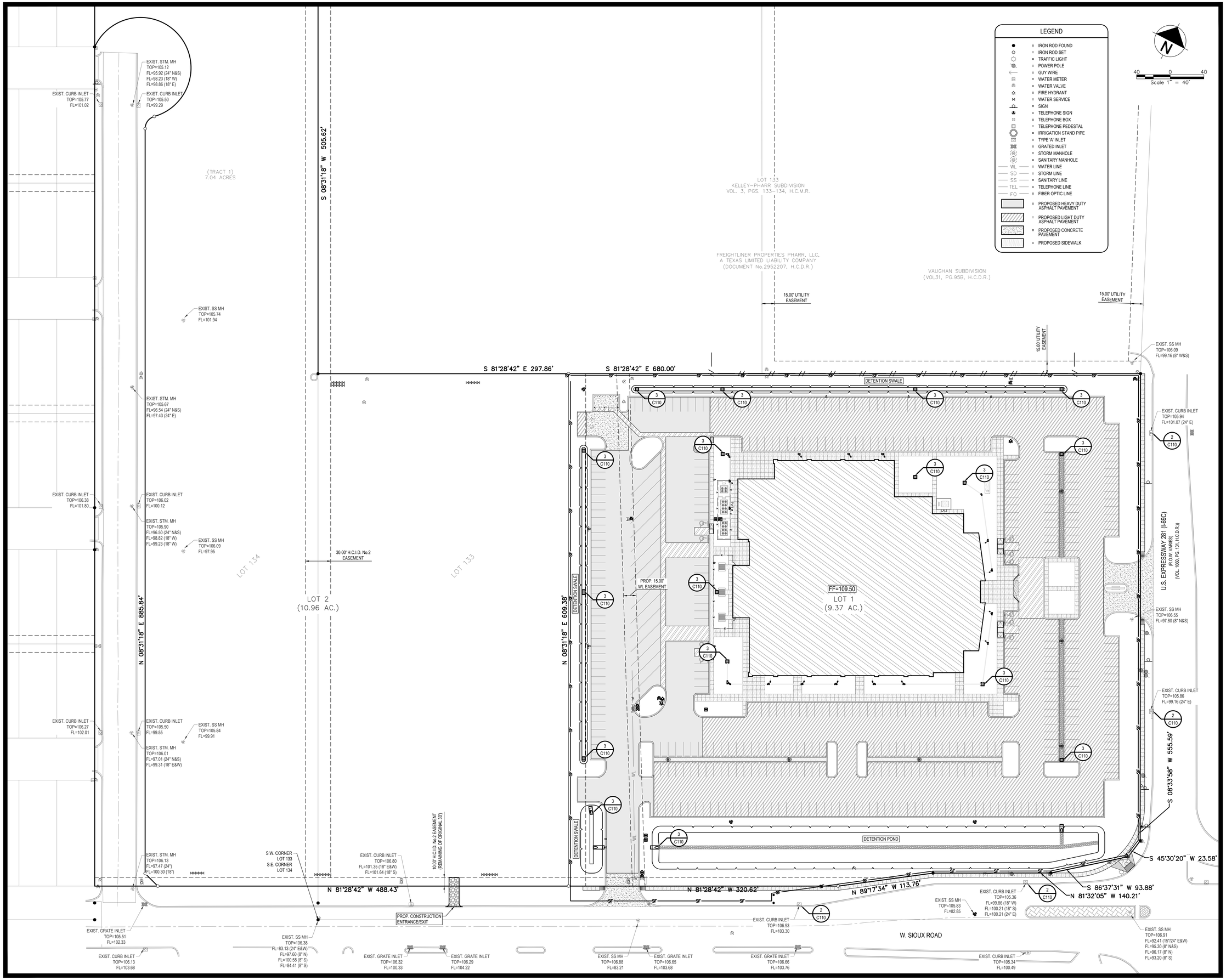
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	6/07/2019
REVISED	

C108
SANITARY SEWER
LINE 'A'



H:\TWG19101-Pharr Aquatics Facility\DESIGN\DWG\01_TWG19101_EC.dwg Jun 07, 2019 - 2:11pm

THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE
Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
608 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

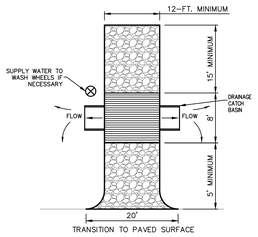
PROPOSED

CITY OF PHARR AQUATIC FACILITY

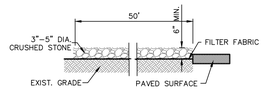
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C109
EROSION CONTROL PLAN



TRANSITION TO PAVED SURFACE



DETAIL NOTES:
A STEEL GRID THAT ALLOWS THE SAFE PASSAGE OF VEHICLES WHILE AGITATING THE TIRES TO LOOSEN AND REMOVE THE SOIL BUILD UP. THE GRID OR STRUCTURES SHALL CONFORM TO THE FOLLOWING:

A. IT SHALL CONSIST OF PIPES OR TUBES SPACED SUCH THAT THERE IS A MINIMUM CLEAR DISTANCE BETWEEN THE PIPES OR TUBES OF 4-1/2". IT SHALL BE ELEVATED ABOVE THE GROUND SURFACE A MINIMUM OF 8" TO ALLOW WATER, DEBRIS, AND SOIL TO DRAIN.

B. MINIMUM DIAMETER OF PIPE OR TUBE SHALL BE 3".

C. IT SHALL BE DESIGNED TO SUPPORT ANY AND ALL VEHICLES ENTERING AND LEAVING THE CONSTRUCTION SITE.

D. IT SHALL BE FIRMLY PLACED IN THE GROUND AT THE EXIT.

E. IT SHALL BE OF SUFFICIENT LENGTH SO THAT THE AGITATION WILL REMOVE THE SOIL FROM THE TIRES OR A MINIMUM OF 8'-0".

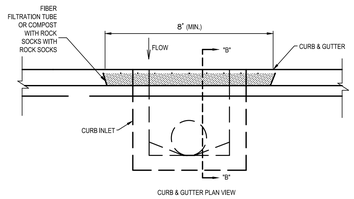
F. AT THE "STREET SIDE" APPROACH OF THE GRID THERE SHALL BE AN IMPERVIOUS SURFACE OR IT SHALL CONSIST OF 3" TO 5" DIAMETER ANGULAR CRUSHED STONE/ROCK APPROXIMATELY 5'-0" IN LENGTH, MINIMUM, AND 8" DEEP, MINIMUM. ON THE "JOB SITE" SIDE OF THE GRID, THERE SHALL BE 3" TO 5" DIAMETER ANGULAR CRUSHED STONE/ROCK 15'-0" IN LENGTH, MINIMUM, 8" DEEP, MINIMUM. THE STEEL GRID WILL BE BETWEEN THE "STREET SIDE" APPROACH AND THE JOB SITE CRUSHED STONE/ROCK. ALL CRUSHED STONE/ROCK SHALL HAVE FILTER FABRIC BENEATH THE STONE/ROCK.

G. STEEL GRID AREA SHALL BE USED AS THE TIRE WASH AREA, WHEN THE TIRE WASH IS IN USE (RAINY OR MUDDY DAYS) THE AREA SHALL BE MANNED AND THE TIRES SHALL BE WASHED USING A HIGH PRESSURE HOSE/NOZZLE.

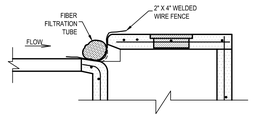
H. THE AREA BENEATH THE GRID SHALL BE SLOPED SUCH THAT DEBRIS, SOIL, AND WATER SHALL BE DIVERTED BACK ON TO THE CONSTRUCTION SITE OR TO A SEDIMENT BASIN. NO WATER, SOIL, OR DEBRIS SHALL LEAVE THE CONSTRUCTION SITE. THE RESULTING DISCHARGE SHALL BE DISPOSED OF PROPERLY.

1 STABILIZED CONSTRUCTION ENTRANCE / EXIT WITH DRAINAGE CATCH BASIN

NOT TO SCALE



CURB & GUTTER PLAN VIEW



SECTION "B-B"

CURB INLET PROTECTION NOTES:

1. WHERE MINIMUM CLEARANCES CAUSE TRAFFIC TO DRIVE IN THE GUTTER, USE 1" X 4" LUMBER SECURED WITH CONCRETE NAILS 3' O.C. NAILED INTO THE CONCRETE. IF PEDESTRIAN TRAFFIC ONLY, THE USE OF 20# GRAVEL BAGS TO SECURE MATERIAL IS PERMITTED.

2. AS SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN IN THIS DETAIL. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.

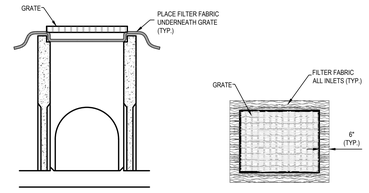
3. DAILY INSPECTION SHALL BE MADE AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2-INCHES.

4. THE PERFORMANCE OF THE INLET PROTECTION SHALL BE MONITORED DURING EACH RAINFALL EVENT AND PROTECTION SHALL BE IMMEDIATELY REMOVED IF THE STORM WATER BEGINS TO OVERTOP THE CURB.

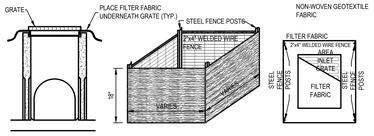
5. INLET PROTECTION SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

2 TEMPORARY CURB PROTECTION DETAIL

NOT TO SCALE



INLET DETAIL



DETAIL NOTES:

1. STEEL POSTS THAT SUPPORT THE SILT FENCE SHALL BE INSTALLED AT EACH CORNER AND IN BETWEEN CORNERS IF THE DISTANCE IS GREATER THAN 6' BETWEEN CORNER POSTS.

2. USE SILT FENCE DETAIL FOR INSTALLATION OF THE SILT FENCE AROUND THE EXISTING OR NEW AREA INLET.

3. THE METAL AREA INLET GRATE SHALL BE LIFTED AND FILTER FABRIC WRAPPED AROUND THE GRATE AND THE GRATE SHALL BE REPLACED.

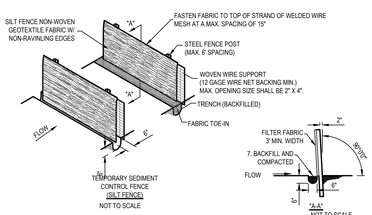
4. IN VEHICULAR TRAFFIC AREAS METAL GRATE SHALL BE LIFTED OUT AND WIRE FENCE MATERIAL SHALL BE PLACED UNDER IT WITH FILTER FABRIC PLACED BETWEEN THE GRATE AND THE WIRE FENCE. THE WIRE FENCE SHALL THEN BE ATTACHED TO THE GRATE.

5. ACCUMULATED SILT SHALL BE REMOVED WHEN THE FILTER FABRIC OVER THE GRATE COMPLETELY COVERS THE GRATE AREA, AND THE SILT AROUND THE SILT FENCE REACHES A HEIGHT OF 6"

6. AREA INLET PROTECTION SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED.

3 TEMPORARY INLET PROTECTION DETAIL

NOT TO SCALE



NOT TO SCALE

DETAIL NOTES:

1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POSTS MUST BE EMBEDDED A MINIMUM OF 12".

2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF THE FLOW. WHERE FENCE CAN NOT BE TRENCHED INTO THE SURFACE (e.g. PAVEMENT) THE FABRIC SHALL BE WEIGHTED DOWN WITH ROCK OR 1" X 4" LUMBER SECURELY FASTENED TO THE SURFACE, ON THE UPSTREAM SIDE TO PREVENT FLOW UNDER THE FENCE.

3. THE TRENCH MUST BE A MINIMUM OF 6" DEEP AND 6" WIDE TO ALLOW FOR THE FILTER FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

4. THE FILTER FABRIC SHALL BE SECURELY FASTENED TO THE WOVEN WIRE BACKING, WHICH IN TURN IS SECURELY FASTENED TO THE STEEL FENCE POST.

5. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6". THE SILT SHALL BE DISPOSED OF ON AN APPROVED SITE AND IN SUCH A MANNER THAT IT WILL NOT CONTRIBUTE TO ADDITIONAL FILTRATION.

6. INSPECTION SHALL BE MADE WEEKLY AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY, IF NEEDED.

7. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED.

4 TEMPORARY SEDIMENT CONTROL FENCE (SILT FENCE) DETAIL

NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34584
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

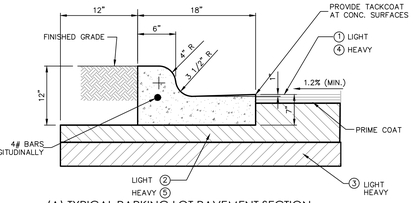
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	6/07/2019
REVISED	

C110
EROSION CONTROL DETAILS



(A) TYPICAL PARKING LOT PAVEMENT SECTION

KEYED NOTES:

1. PROPOSED 2.0 INCHES OF HOT MIX ASPHALTIC CONCRETE SURFACE COURSE WITH LIMESTONE AGGREGATES AND FILLERS TYPE D ITEM 340 (2014 TxDOT STANDARD SPECIFICATIONS) COMPACTION TO WITHIN AN AIR VOID RANGE OF 5 TO 9 PERCENT FROM MAXIMUM THEORETICAL GRAVITY PER TxDOT TEX-227-F.
2. PROPOSED 8 INCHES CALICHE TREATED GRAVEL FLEXIBLE BASE MATERIAL COMPOSED OF CRUSHED OR UNCRUSHED GRAVEL TYPES B OR C GRADES 1-3 ITEM 247 (2014 TxDOT STANDARD SPECIFICATIONS) COMPACTED TO 98 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED MOISTURE-DENSITY RELATIONSHIP (A.S.T.M. 1557) AT MOISTURE CONTENT WITHIN 2 PERCENT OF OPTIMUM MOISTURE.
3. 6 INCHES OF COMPACTED STABILIZED SUBGRADE TREATED WITH 2 PERCENT LIME IN ACCORDANCE TO ITEM 260 (2004 TxDOT STANDARD SPECIFICATIONS) COMPACTED TO 95 PERCENT OF THE STANDARD EFFORT (ASTM D648) MAXIMUM DRY DENSITY WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT.
4. PROPOSED 2.5 INCHES OF HOT MIX ASPHALTIC CONCRETE SURFACE COURSE WITH LIMESTONE AGGREGATES AND FILLERS TYPE D ITEM 340 (2014 TxDOT STANDARD SPECIFICATIONS) COMPACTION TO WITHIN AN AIR VOID RANGE OF 5 TO 9 PERCENT FROM MAXIMUM THEORETICAL GRAVITY PER TxDOT TEX-227-F.
5. PROPOSED 10 INCHES CALICHE TREATED GRAVEL FLEXIBLE BASE MATERIAL COMPOSED OF CRUSHED OR UNCRUSHED GRAVEL TYPES B OR C GRADES 1-3 ITEM 247 (2014 TxDOT STANDARD SPECIFICATIONS) COMPACTED TO 98 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED MOISTURE-DENSITY RELATIONSHIP (A.S.T.M. 1557) AT MOISTURE CONTENT WITHIN 2 PERCENT OF OPTIMUM MOISTURE.

FLEXIBLE BASE MATERIAL REQUIREMENTS

MATERIAL TYPES. DO NOT USE FILLERS OR BINDERS UNLESS APPROVED. FURNISH THE TYPE SPECIFIED ON THE PLANS IN ACCORDANCE WITH THE FOLLOWING.

TYPE A. CRUSHED STONE PRODUCED AND GRADED FROM OVERSIZE QUARRIED AGGREGATE THAT ORIGINATES FROM A SINGLE, NATURALLY OCCURRING SOURCE. DO NOT USE GRAVEL OR MULTIPLE SOURCES.

TYPE B. CRUSHED OR UNCRUSHED GRAVEL. BLENDING OF 2 OR MORE SOURCES IS ALLOWED.

TYPE C. CRUSHED GRAVEL WITH A MINIMUM OF 60% OF THE PARTICLES RETAINED ON A NO. 4 SIEVE WITH 2 OR MORE CRUSHED FACES AS DETERMINED BY TEX-460-A, PART I. BLENDING OF 2 OR MORE SOURCES IS ALLOWED.

TYPE D. TYPE A MATERIAL OR CRUSHED CONCRETE. CRUSHED CONCRETE CONTAINING GRAVEL WILL BE CONSIDERED TYPE D MATERIAL. CRUSHED CONCRETE MUST MEET THE REQUIREMENTS IN SECTION 247.2.1.3.2. (2014 TXDOT STANDARD SPECIFICATIONS MANUAL), "RECYCLED MATERIAL (INCLUDING CRUSHED CONCRETE) REQUIREMENTS," AND BE MANAGED IN A WAY TO PROVIDE FOR UNIFORM QUALITY. THE ENGINEER MAY REQUIRE SEPARATE DEDICATED STOCKPILES IN ORDER TO VERIFY COMPLIANCE.

TYPE E. CALICHE MATERIAL (AGGILLACEOUS LIMESTONE, CALCEROUS OR CALCEROUS CLAY PARTICLES). IF MATERIAL REQUIRES THE ADDITION OF LIME OR CEMENT TO MEET STRENGTH REQUIREMENTS FOR GRADE 4. THE COST FOR PERCENT LIME OR CEMENT TO BE ADDED SHALL BE SUBSIDIARY TO THE FLEXIBLE BASE UNIT PRICE AND INCLUDED WITH THE FINAL COST FOR PLACEMENT OF THE FLEXIBLE BASE.

GENERAL NOTES:

A. CONCRETE CURB AND GUTTER SHALL BE PLACED ON AN APPROVED FOUNDATION CONFORMING TO THE REQUIREMENTS OF THE FLEXIBLE BASE SPECIFICATIONS

B. THE PERCENT OF DENSITY AS DETERMINED BY COMPACTION RATIO (TEX-113-E) FOR THE NEW FLEXIBLE BASE SHALL BE A MINIMUM OF 98%

C. THE CONTRACTOR'S ATTENTION IS CALLED TO THE FACT THAT CERTAIN EXISTING AND/OR PROPOSED STRUCTURES MAY BE WITHIN THE LIMITS OF THE FLEXIBLE BASE AND TREATED SUBGRADE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION OPERATIONS WITHOUT DAMAGE TO THESE STRUCTURES.

D. MOISTURE CONTENT ON FLEX BASE MATERIAL SHALL BE TESTED IN ACCORDANCE WITH (A.S.T.M. 1557 AND GT EX-103-E).

E. TREAT NEWLY CONSTRUCTED FLEX BASE SURFACE WITH MC-30 ASPHALT MATERIAL MEETING REQUIRMENT OF ITEM 300 (TxDOT STANDARD SPECIFICATIONS) AT A RATE OF 0.22 TO 0.50 GAL/SY BEFORE PLACEMENT OF H.M.A.C. SURFACE.

F. THE CONTRACTOR SHALL EXERCISE DILIGENCE IN THE APPLICATION OF ASPHALT BY THE USE OF FLAGGING AND ROLLING PROCEDURES TO KEEP FROM SPRAYING OR SPLATTERING THE TRAVELING PUBLIC WITH ASPHALTIC MATERIAL.

G. TACK COAT LAYER SHALL BE APPLIED BETWEEN H.M.A.C. LIFTS BETWEEN CONCRETE STRUCTURES AND ASPHALT AND SHALL BE SUBSIDIARY TO ASPHALT SURFACE COURSE ITEM.

H. TACK COAT BINDERS INCLUDE CSS-1H, SS-1H, AND PG 64-22.

J. ALL CONCRETE SHALL BE TYPE A(2004 TXDOT SPECS) AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI @ 28 DAYS.

K. AT THE EXPENSE OF THE CONTRACTOR AND TO THE SATISFACTION OF THE ENGINEER, REMOVE AND REPLACE ANY HOT MIX ASPHALTIC CONCRETE SURFACE COURSE THAT DOES NOT BOND OR THAT HAS IRREGULARITIES SUCH AS SEGREGATION, RUTTING, RAVELING, FLUSHING FATSPOTS, MAT SLIPPAGE, COLOR, TEXTURE, ROLLER MARKS, TEARS, GOUGES, STREAKS, OR UNCOATED AGGREGATED PARTICLES OR SURFACE THAT DO NOT MEET TYPE A SURFACE RIDE QUALITY IN ACCORDANCE TO ITEM 585 OF TECHNICAL SPECIFICATIONS.

L. IF IT IS NECESSARY TO USE ADDITIVES TO THE FLEXIBLE BASE MATERIAL TO MEET STANDARD SPECIFICATIONS, THE AMOUNT OF THE ADDITIVE SHOULD BE LIMITED TO AVOID A RIGID BASE.

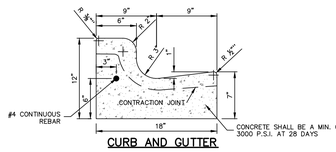
M. THE SPECIFIED PERCENT OF LIME IS FOR ESTIMATING AND PLANNING. THE ACTUAL QUANTITY OF LIME REQUIRED SHOULD BE DETERMINED AT THE TIME OF CONSTRUCTION BY LABORATORY TESTS ON BULK SAMPLES OF THE SUBGRADE SOILS.

PROPERTY	TEST METHOD	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Master gradation sieve size (% retained)	Tex-110-E					
2-1/2 inches		0	0	0	–	0
2 inches		–	–	–	0	–
1-3/4 inches		0-10	0-10	0-10	–	0-5
7/8 inches		10-35	10-35	–	–	10-35
1/2 inches		–	–	–	20-60	–
3/8 inches		30-65	30-65	–	–	35-65
No. 4		45-75	45-75	45-75	40-75	45-75
No. 40		65-90	65-90	50-85	70-90	70-90
Liquid limit, % max. (see note 1)	Tex-104-E	40	40	40	–	35
Plastic index, max. (see note 1)	Tex-106-E	10	10	12	15	10
Plastic index, min. (see note 1)		AS SHOWN ON THE PLANS				
Wet ball mill, % max. (see note 2)	Tex-116-E	40	40	–	50	40
Wet ball mill, % max. increase passing the No. 40 sieve.		20	20	–	–	20
Classification (see note 3)	Tex-117-E	1.0	1.1-2.3	–	–	–
Min. compressive strength, psi (see note 3)						
lateral pressure 0 psi		35	35	–	–	–
lateral pressure 3 psi		–	–	–	–	90
lateral pressure 15 psi		175	175	–	150	175

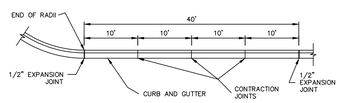
1. DETERMINE PLASTIC INDEX IN ACCORDANCE WITH TEX-107-E (LINEAR SHRINKAGE) WHEN LIQUID LIMIT IS UNATTAINABLE AS DEFINED IN TEX-104-E.
2. WHEN A SOUNDNESS VALUE IS REQUIRED BY THE PLANS, TEST MATERIAL IN ACCORDANCE WITH TEX-411-A.
3. MEET BOTH THE CLASSIFICATION AND THE MINIMUM COMPRESSIVE STRENGTH, UNLESS OTHERWISE SHOWN ON THE PLANS.

1 TYPICAL ASPHALT PARKING LOT PAVEMENT SECTION

NOT TO SCALE



CURB AND GUTTER

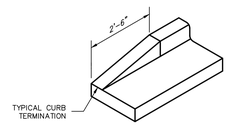


TYPICAL JOINTS

GENERAL NOTES:

1. ALL CONCRETE WORK SHALL BE TREATED WITH MEMBRANE CURING COMPOUND TYPE 2 WHITE PIGMENTED IN ACCORDANCE w/ TXDOT 1972 SPECIFICATIONS ITEM 531. CONSIDERED INCIDENTAL TO CONCRETE WORK.
2. 1/2" EXPANSION JOINTS REQUIRED AT 40' c.c. AND AT THE BEGINNING AND END OF ALL RADII. CONTRACTION JOINTS SHALL NOT EXCEED 10' c.c. (SEE SPECIFICATIONS FOR JOINT MATERIAL)

2 CURB AND GUTTER DETAIL

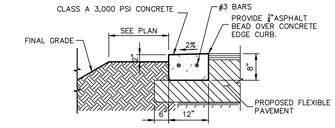


NOTES:

1. PROVIDE 1/2" EXPANSION JOINT @ 10'-0" O.C. 2. ALL EXPOSED SURFACES SHALL BE STRIPPED GREEN TROWELD AND CURB EDGING RUBBED SMOOTH.
2. 3000 psi CONCRETE

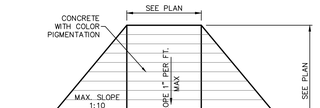
3 TYPICAL CURB TERMINATION

NOT TO SCALE

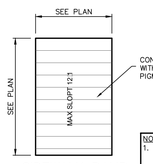


4 TYPICAL CONCRETE EDGE CURB DETAIL

NOT TO SCALE



SIDEWALK RAMP



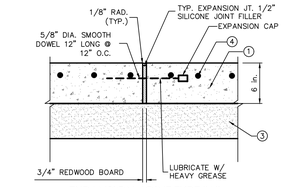
SIDEWALK RAMP

NOTE:

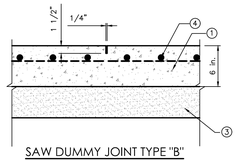
1. RAMPS SHALL BE GROOVED 1/4" DEEP, 3/4" WIDE AND 2" APART. COLOR PIGMENTATION SHALL BE ADDED TO THE CONCRETE AS COLOR CONTRASTING AGENT, "MALAYAN BUFF", OF DIRECT COLORS OR APPROVED EQUAL SHALL BE UTILIZED. ALL AS PER TEXAS ACCESSIBILITY STANDARDS (T.A.S.).
2. MAXIMUM PERMISSIBLE SLOPE = 12:1
3. USE 3000 PSI CONCRETE

5 RAMP DETAILS

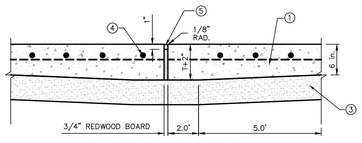
NOT TO SCALE



EXPANSION JOINT TYPE "A"



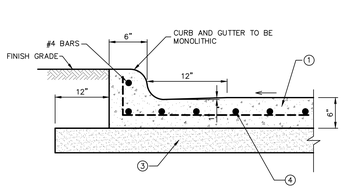
SAW DUMMY JOINT TYPE "B"



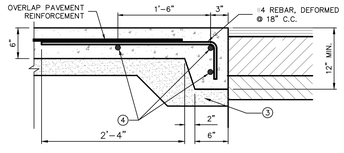
ISOLATION JOINT - TYPE "C"

SPACING OF CONTROL JOINTS IN FEET

SLAB THICKNESS, IN.	SLUMP 4 TO 6 IN. MAXIMUM-SIZE AGGREGATE, LESS THAN 3/4 IN.	SLUMP 4 TO 6 IN. MAXIMUM-SIZE AGGREGATE, 3/4 IN. AND LARGER	SLUMP LESS THAN 4 IN.
5	10	12.5	15
6	12	15	18
7	14	18	21
8	16	20	24
9	18	23	27
10	20	25	30



CONCRETE PAVEMENT SECTION



PAVEMENT TERMINATION DETAIL

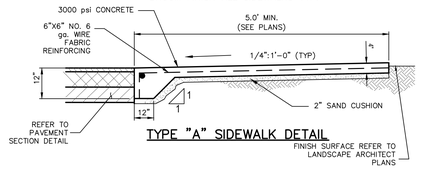
KEYED NOTES:

1. PROPOSED 6 INCHES REINFORCED CONCRETE PAVEMENT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGHT OF 4000 P.S.I. MATERIALS AND PROPERTIES SHALL MEET APPLICABLE REQUIREMENTS IN THE ACI MANUAL OF CONCRETE PRACTICE.
2. PROPOSED 4 INCHES CALICHE TREATED GRAVEL FLEXIBLE BASE MATERIAL COMPOSED OF CRUSHED OR UNCRUSHED GRAVEL TYPES B OR C GRADES 1-3 ITEM 247 (2014 TxDOT STANDARD SPECIFICATIONS) COMPACTED TO 98 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED MOISTURE-DENSITY RELATIONSHIP (A.S.T.M. 1557) AT MOISTURE CONTENT WITHIN 2 PERCENT OF OPTIMUM MOISTURE.
3. 6 INCHES OF COMPACTED STABILIZED SUBGRADE TREATED WITH 2 PERCENT LIME IN ACCORDANCE TO ITEM 260 (2004 TxDOT STANDARD SPECIFICATIONS) COMPACTED TO 95 PERCENT OF THE STANDARD EFFORT (ASTM D648) MAXIMUM DRY DENSITY WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT.
4. REINFORCEMENT SHALL CONSIST OF THE FOLLOWING: NUMBER 4 BARS SPACED AT 18 INCHES ON CENTER IN BOTH DIRECTIONS
5. EXPANSION SILICONE JOINT FILLER/SEALER.
6. 80 MM TRAFFIC RATED CONCRETE PAVERS BY INOVATIVE BLOCK OR APPROVED EQUAL.
7. JOINT SAND FILLER MATERIAL AS PER MANUFACTURER'S RECOMMENDATIONS AND TO CONFORM TO GRADING REQUIREMENTS OF ASTM C 144.
8. 1 TO 1¼ INCH BEDDING SAND MATERIAL CONFORMING WITH GRADING REQUIREMENTS OF ASTM C 33.
9. 8 INCH WIDE PRECAST FIBER REINFORCED POLYMER BODY TRENCH DRAIN SYSTEM WITH HEAVY DUTY STEEL FRAME AND TRAFFIC RATED ADA APPROVED 10 INCH WIDE DUCTILE IRON GRATE BY DURATRENCH (MODEL DTFF-0.5-10C24CI-HDP). OR APPROVED EQUAL

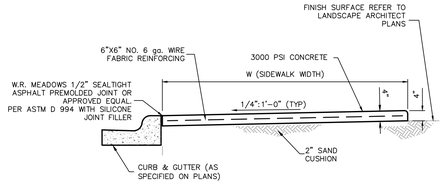
6 TYPICAL REINFORCED CONCRETE PAVEMENT SECTION & JOINT DETAILS

NOT TO SCALE

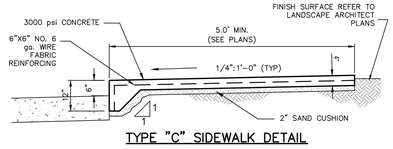
NOTE: EXPANSION JOINTS @ 20' O.C. TYP.
W/ ASPHALTIC MATERIAL (1/2") 1/4"
"DUMMY JOINTS" (CONTROL JOINTS) @ 5' O.C.
3000 PSI CONC. TYP.
BROOM FINISH ALL SIDEWALKS TYP.



TYPE "A" SIDEWALK DETAIL



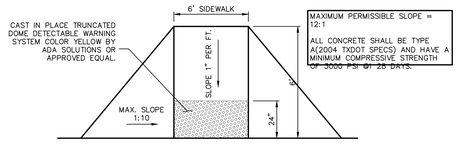
TYPE "B" SIDEWALK DETAIL



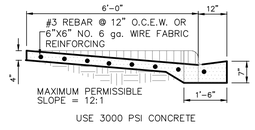
TYPE "C" SIDEWALK DETAIL

7 SIDEWALK DETAILS

NOT TO SCALE



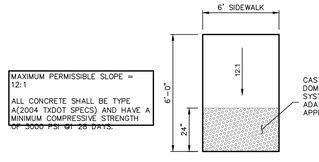
SIDEWALK RAMP ALONG CURB DETAIL



USE 3000 PSI CONCRETE

SECTION VIEW

NOT TO SCALE



SIDEWALK RAMP

8 SIDEWALK RAMP DETAILS

NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS — JORGE D. PEREZ — 34594 — REGISTERED — PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

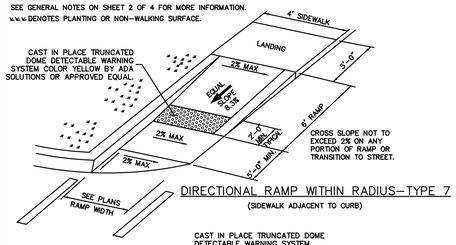
PROJECT 971805
DATE 6/07/2019
REVISED

C111
TYPICAL DETAILS

NOTES:

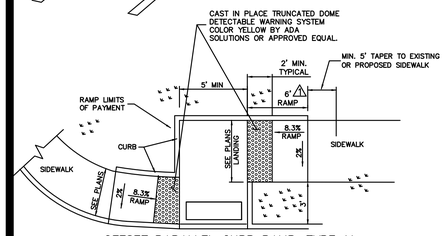
SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

▲▲▲ DENOTES PLANTING OR NON-WALKING SURFACE.

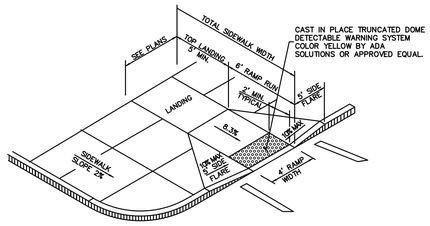


DIRECTIONAL RAMP WITHIN RADIUS–TYPE 7

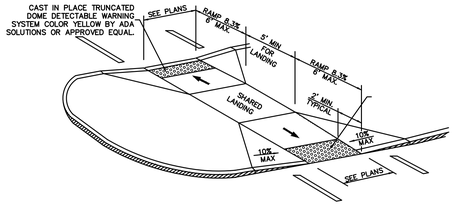
(SIDEWALK ADJACENT TO CURB)



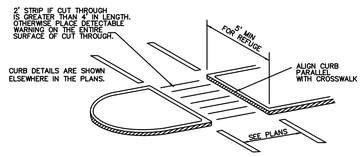
OFFSET PARALLEL CURB RAMP–TYPE 11



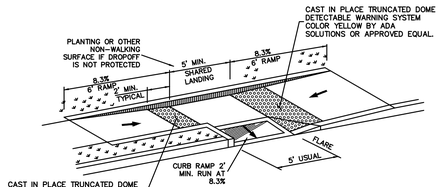
PERPENDICULAR CURB RAMP–TYPE 5



CURB RAMP AT MEDIAN ISLANDS–TYPE 12



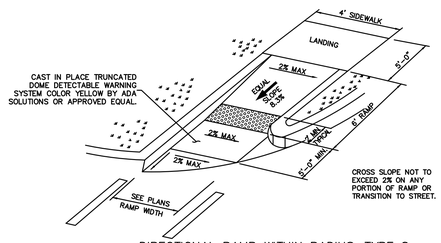
CURB RAMP AT MEDIAN ISLANDS–TYPE 13



PARALLEL CURB RAMP–TYPE 10

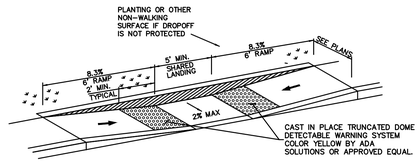
1 HANDICAP RAMP DETAIL

NOT TO SCALE



DIRECTIONAL RAMP WITHIN RADIUS–TYPE 8

(SIDEWALK SET BACK FROM CURB)

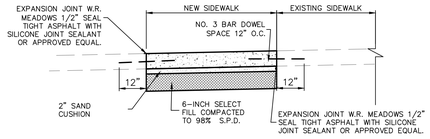


PARALLEL CURB RAMP–TYPE 6

(USE ONLY WHERE WATER WILL NOT POND IN THE LANDING.)

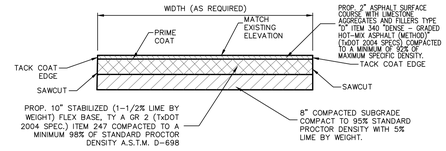
2 EXISTING SIDEWALK CONNECTION

NOT TO SCALE



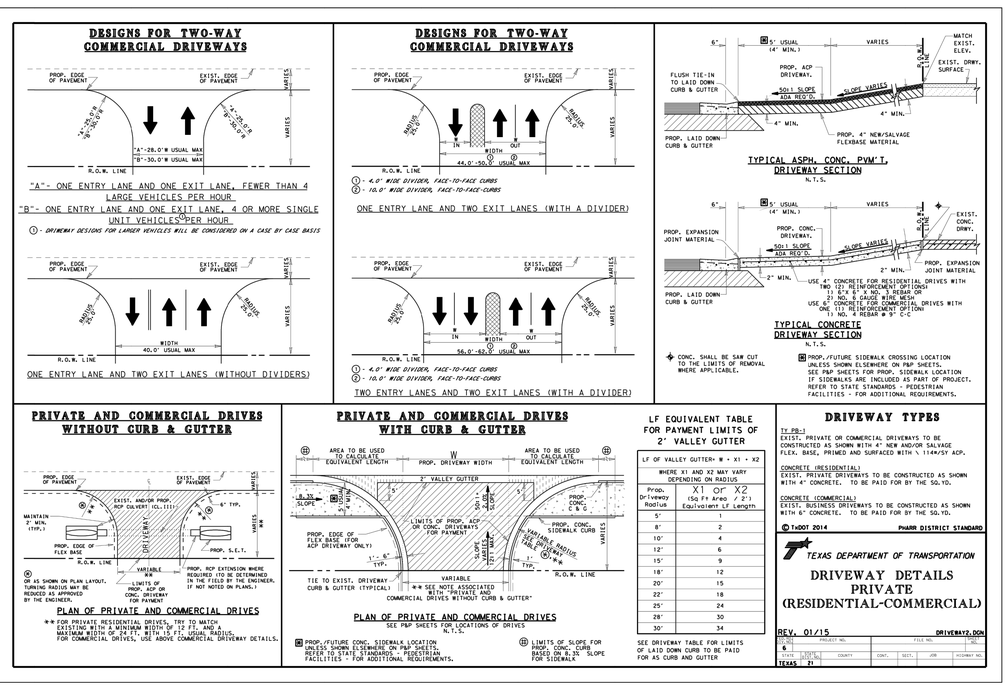
3 SIDEWALK REPAIR DETAIL

NOT TO SCALE



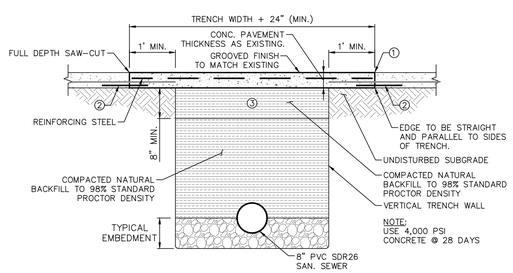
4 PAVEMENT REPAIR DETAIL

NOT TO SCALE



5 TYPICAL CONCRETE DRIVEWAY DETAIL

NOT TO SCALE



NOTES:

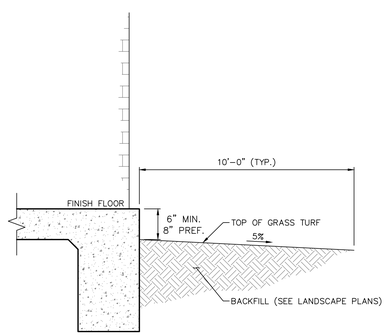
① JOINT FILLER – NEOPRENE FILLER ASTM D 1752–TYPE I.

② SIKA ANCHOR FIX 500 SYSTEM–DOWELS TO MATCH SIZE AND SPACING.

③ 8" FLEX BASE MIN. ITEM 247, TYPE E GRADE 3, COMPACTED TO 98% STANDARD PROCTOR DENSITY.

6 CONCRETE PAVEMENT REPLACEMENT DETAIL (SIOUX ROAD)

NOT TO SCALE



7 TYPICAL SECTION AT BUILDING PERIMETER

NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers

Texas Registered Engineering Firm F–2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631–4482 fax (956) 682–1545

PROPOSED

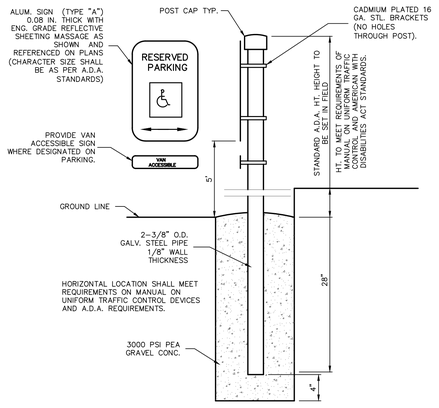
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

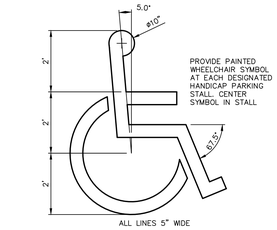
PROJECT	971805
DATE	6/07/2019
REVISED	

C112

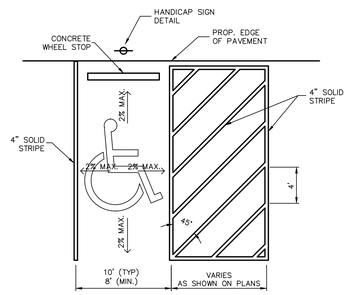
TYPICAL DETAILS



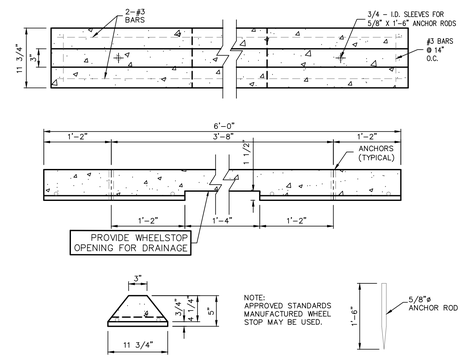
1 HANDICAP SIGN DETAIL
NOT TO SCALE



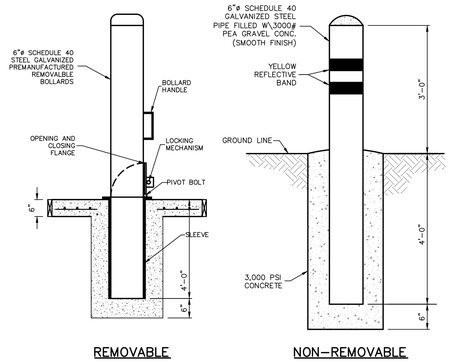
2 WHEEL CHAIR SYMBOL DETAIL
NOT TO SCALE



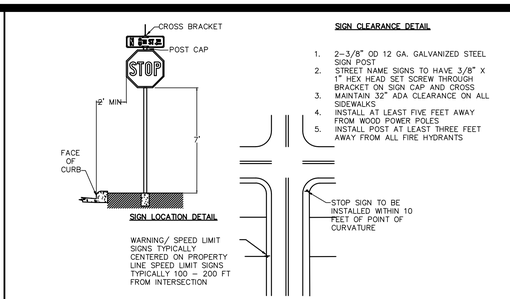
3 HANDICAPPED PARKING SPACE DETAIL
NOT TO SCALE



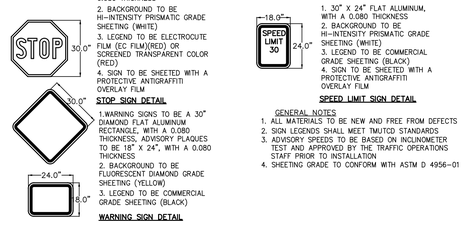
4 WHEEL STOP DETAIL
NOT TO SCALE



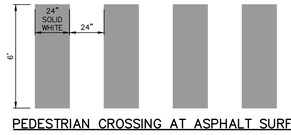
5 REMOVABLE BOLLARD DETAIL
NOT TO SCALE



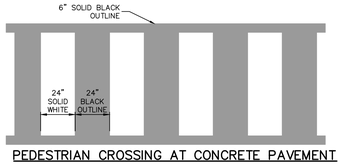
6 SIGN LOCATION STANDARDS DETAIL
NOT TO SCALE



7 SIGN MATERIAL STANDARDS DETAIL
NOT TO SCALE

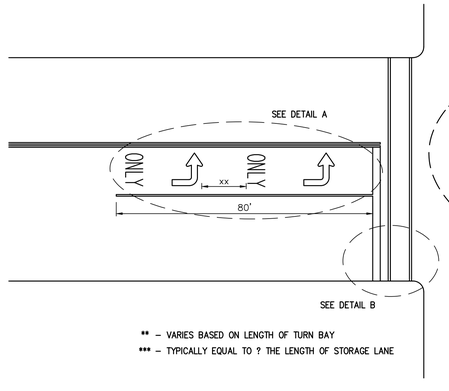


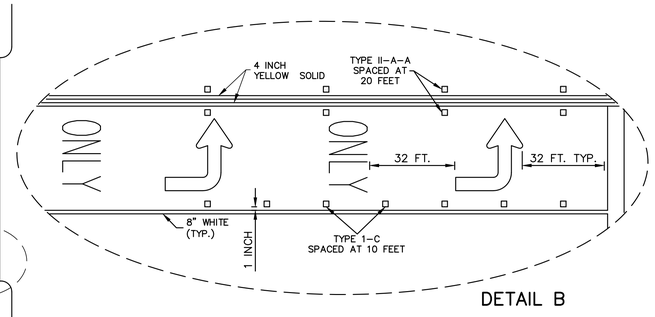
PEDESTRIAN CROSSING AT ASPHALT SURFACE



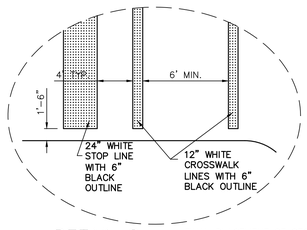
PEDESTRIAN CROSSING AT CONCRETE PAVEMENT

8 CROSSWALK DETAIL
NOT TO SCALE



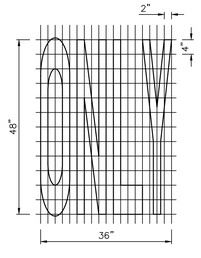


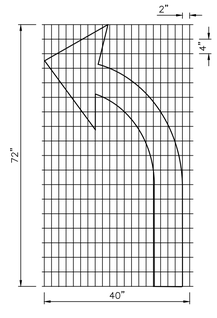
DETAIL B



DETAIL C

FINAL PLACEMENT OF STOP BAR AND CROSSWALK SHALL BE APPROVED BY THE ENGINEER IN THE FIELD.





9 PAVEMENT MARKING DETAILS
NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34694
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

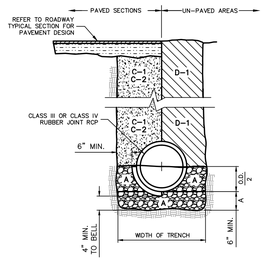
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C113
TYPICAL DETAILS



GENERAL NOTES:

1. BACKFILL THE EXCAVATION AFTER PAVEMENT OF THE PERMANENT STRUCTURE. USE BACKFILL FREE FROM STONES LARGE ENOUGH TO INTERFERE WITH COMPACTION; LARGE OR FROZEN JUMPS THAT WILL NOT BRAKE DOWN READILY UNDER COMPACTING; A WOOD OR OTHER EXTRANEOUS MATERIAL. OBTAIN BACKFILL MATERIAL FROM EXCAVATION OR FROM OTHER SOURCES. CONTRACTOR SHALL REFER TO SECTION 02221 OF SPECIFICATIONS. BEFORE CONSTRUCTION.

2. WIDTH OF TRENCH

INSIDE DIAMETER OF PIPE (INCHES)	WIDTH OF TRENCH AT TOP OF PIPE (INCHES)
12 – 33	O.D. + 16
36 – 78	O.D. + 24
80 AND LARGER	O.D. + 30

3. PROVIDE PRECAST REINFORCED CONCRETE PIPE THAT CONFORMS TO THE DESIGN SHOWN ON THE PLANS AND TO ASTM C76

4. BACKFILL SHALL BE CLEAR OF ORGANIC MATERIALS, CONSTRUCTION DEBRIS OR TRASH. IT SHALL MEET THE FOLLOWING STANDARDS.

A – ANGULAR CRUSHED STONE OR ROCK OR CRUSHED GRAVEL. 100% PASSING 1 1/2" SIEVE, LESS THAN 10% PASSING NO. 4 SIEVE AND LESS THAN 5% PASSING NO. 200 SIEVE.

C–1 SELECT BACKFILL OR COHESIONLESS MATERIAL / SAND

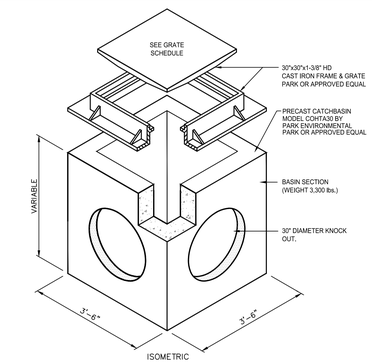
SELECT BACKFILL – EXCAVATED MATERIAL BACKFILL OR CLEAN LOCAL MATERIAL CONSISTENT WITH THE SURROUNDING EARTH MATERIAL MAY BE USED (REFER TO SECTION 02221 OF SPECIFICATIONS) . PLACE BACKFILL IN UNIFORM LAYERS AT MOST 10 IN. DEEP (LOOSE MEASUREMENT) COMPACT EACH LAYER TO 95% STD PROCTOR DENSITY (ASTM D-698 & ASTM 4253) BRING EACH LAYER OF BACKFILL MATERIAL TO THE MOISTURE CONTENT NEEDED TO OBTAIN THE REQUIRED DENSITY. COMPACT EACH LIFT MECHANICALLY (ROLLERS MAY BE USED IF FEASIBLE).

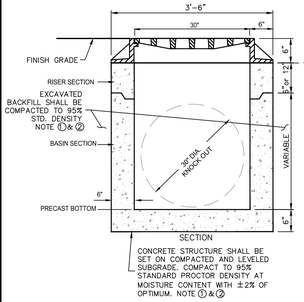
COHESIONLESS MATERIAL / SAND – USE WELL GRADED OR POORLY GRADED SANDS WITH MORE THAN 50% PASSING No. 4 SIEVE, BUT LESS THAN 12% PASSING No. 200 SIEVE AND HAVE A PLASTICITY INDEX LESS THAN 4. PLACE SAND IN UNIFORM LAYERS AT MOST 10 IN. DEEP. COMPACT MATERIAL USING VIBRATORY EQUIPMENT OR MECHANICAL EQUIPMENT. WATER POUNDING / WATER JETTING WILL BE ALLOWED ONLY IF APPROVED IN WRITING BY THE CITY OR ENGINEER. (ASTM D–1557 OR TX 113–E)

C–2 SAND CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT, AS PER ITEM 400 SECTION 400.3.C OF THE 2000 TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.

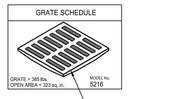
D–1 SELECT BACKFILL – PLACE BACK FILL IN UNIFORM LAYERS AT MOST 12 IN. DEEP. COMPACT EACH LAYER TO 90% STD PROCTOR DENSITY. COMPACT EACH LIFT MECHANICALLY (ROLLERS MAY BE USED IF FEASIBLE).

1 TYPICAL REINFORCED R.C.P. STORM SEWER TRENCH DETAIL
NOT TO SCALE

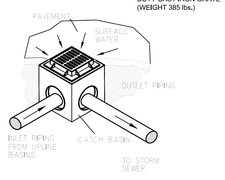




CONCRETE STRUCTURE SHALL BE SET ON COMPACTED AND LEVELED SUBGRADE. COMPACT TO 95% STANDARD PROCTOR DENSITY AT MOISTURE CONTENT WITH ±2% OF OPTIMUM. NOTE ①&②



38-1/4"x 38-1/4"x 2" HEAVY DUTY CAST IRON GRATE (WEIGHT 385 lbs.)



NOTES:

① BRING EACH LAYER (10 INCHES DEEP) TO THE MOISTURE CONTENT NEEDED TO OBTAIN THE REQUIRED DENSITY. USE MECHANICAL TAMPS OR RAMMERS TO COMPACT EXCAVATED BACKFILL.

② COHESIONLESS MATERIAL SUCH AS SAN MAY BE USED FOR BACKFILLING, COMPACT COHESIONLESS MATERIALS USING VIBRATORY EQUIPMENT.

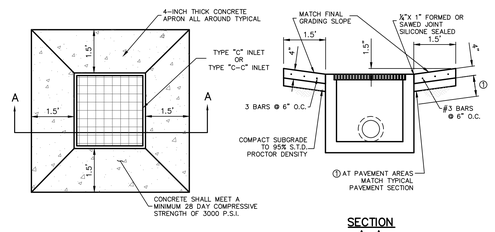
SPECIFICATIONS

CONCRETE : Class 1 concrete with of design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth. Rated for H-20 Loading.

REINFORCEMENT: Grade 60 reinforced with steel rebar to conform to ASTM A615 on required centers or equal.

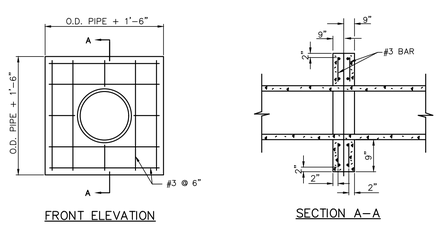
C.I. CASTINGS: Cast iron frames and grates are manufactured of gray cast iron conforming to ASTM A48–76 Class 30.

2 PRECAST TY. C GRATE INLET (PARK OR APPROVED EQUAL)
NOT TO SCALE



SECTION A–A

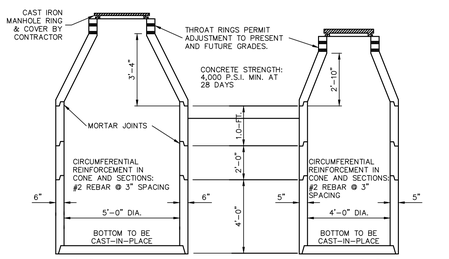
3 CONCRETE APRON AT GRATE INLET DETAIL
NOT TO SCALE



FRONT ELEVATION

SECTION A–A

4 CONCRETE PIPE COLLAR DETAIL
NOT TO SCALE



WEIGHTS OF 5'–0" DIA. MANHOLE

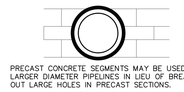
THROAT RING	90 LBS.
CONE SECTION	2800 LBS.
1'–0" SECTION	1329 LBS.
2'–0" SECTION	2658 LBS.
3'–0" SECTION	3987 LBS.
4'–0" SECTION	5316 LBS.

MANHOLES SECTIONS ARE CAST IN

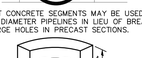
1'–0" LENGTHS	
2'–0" LENGTHS	
3'–0" LENGTHS	
4'–0" LENGTHS	

WEIGHTS OF 4'–0" DIA. MANHOLE

THROAT RING	90 LBS.
CONE SECTION	1750 LBS.
1'–0" SECTION	875 LBS.
2'–0" SECTION	1750 LBS.
3'–0" SECTION	2625 LBS.
4'–0" SECTION	3500 LBS.

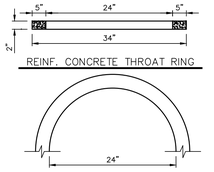


PRECAST CONCRETE SEGMENTS MAY BE USED ON LARGER DIAMETER PIPELINES IN LIEU OF BREAKING OUT LARGE HOLES IN PRECAST SECTIONS.

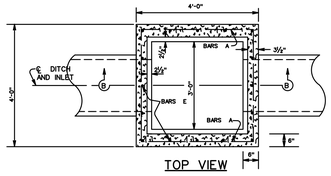


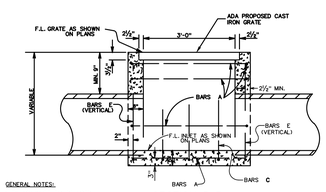
SEGMENTAL BLOCK

5'–0" DIA. – 15 BLOCKS FULL CIRCLE
4'–0" DIA. – 12 BLOCKS FULL CIRCLE



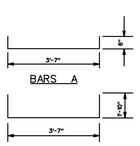
5 CIRCULAR CONCRETE MANHOLE DETAILS (STORM SEWERS)
NOT TO SCALE





GENERAL NOTES:
1.) "C" INLET TO BE USED FOR PIPES LESS OR EQUAL TO 24"
2.) USE GALVANIZED STEEL IN ALL INLET GRATES

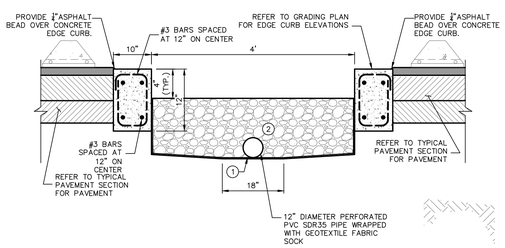
INLET TY "C"

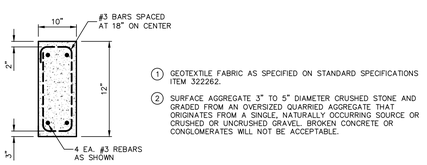


REINFORCING STEEL DETAILS

NOTE: ALL STEEL TO BE NO. 4 BARS ON 12" SPACING IN BOTH DIRECTIONS

6 TYPE "C" INLET DETAIL (CAST IN PLACE)
NOT TO SCALE

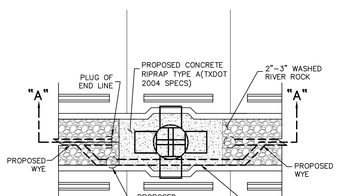




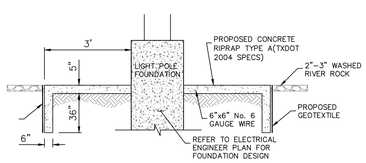
① GEOTEXTILE FABRIC AS SPECIFIED ON STANDARD SPECIFICATIONS ITEM 322262.

② SURFACE AGGREGATE 3" TO 5" DIAMETER CRUSHED STONE AND GRADED FROM AN OVERSIZED QUARRIED AGGREGATE THAT ORIGINATES FROM A SINGLE, NATURALLY OCCURRING SOURCE OR CRUSHED OR UNCRUSHED GRAVEL. BROKEN CONCRETE OR CONGLOMERATES WILL NOT BE ACCEPTABLE.

7 BIO-FILTRATION/DETENTION BASIN TYPICAL DETAIL
NOT TO SCALE

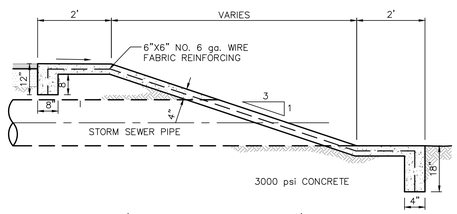


PLAN



SECTION A–A

8 EDGE CURB TRANSITION AT LIGHT POLE FOUNDATION
NOT TO SCALE



9 CONCRETE SLOPED-END TREATMENT DETAIL
NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F–2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631–4482 fax (956) 682–1545

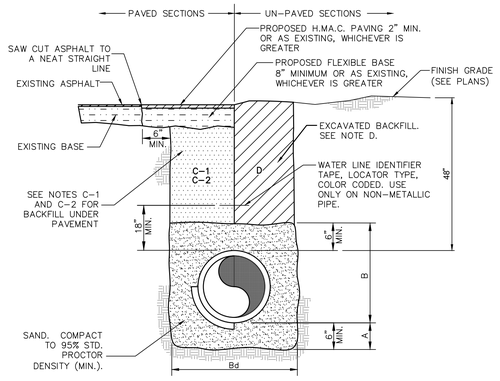
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	6/07/2019
REVISED	

C114
TYPICAL DETAILS



GENERAL NOTES:

A. SAND BEDDING PLACED, HAND LEVELED, AND COMPACTED BEFORE PIPE IS LAID, UP TO BOTTOM OF PIPE (MIN. THICKNESS = 6").

B. SAND BACKFILL PLACED AND COMPACTED AFTER PIPE IS LAID, FROM BOTTOM OF PIPE TO 6" ABOVE THE TOP OF PIPE. WORK IN UNDER PIPE HAUNCHES AND COMPACT BY HAND TO SPRING LINE. USE VIBRATORY-TYPE COMPACTORS FOR LIFTS ABOVE THE SPRING LINE. MAXIMUM 6" LIFTS.

Bd. MINIMUM TRENCH WIDTH: PIPE O.D. + 16" (FOR 16" PIPE AND SMALLER) OR PIPE O.D. X 1.25 + 12" (FOR 18" PIPE AND LARGER)

C-1. (CITY STREETS, PARKING AREA, AND DRIVEWAYS) SELECT EXCAVATED BACKFILL MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 8" MAX. LIFTS.

C-2 (STATE MAINTAINED ROADWAY) SAND/CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT COMPACTED TO 95% STANDARD PROCTOR DENSITY.

D. EXCAVATED EARTH BACKFILL MECHANICALLY COMPACTED IN 12" MAX. LIFTS. MINIMUM STANDARD PROCTOR DENSITY: 90% OUTSIDE RIGHT OF WAY; 95% INSIDE RIGHT OF WAY

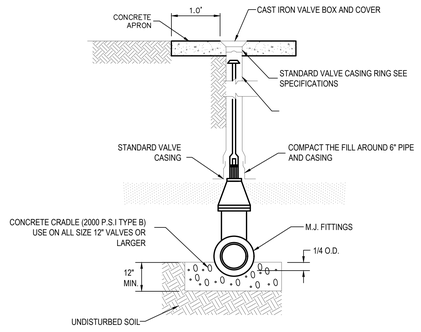
EMBEDMENT SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM D 2321. EMBEDMENT MATERIAL SHALL BE CLASS II OR III WITH < 50% PASSING A No. 200 SIEVE AND PLASTICITY INDEX < 7.

WHERE THIS STANDARD CONFLICTS WITH THE RECOMMENDATION OF ANY GEOTECHNICAL REPORT, OBTAIN WRITTEN CLARIFICATION FROM THE UTILITY ENGINEER PRIOR TO CONSTRUCTION.

FOUNDATION PREPARATION USING COBBLES, GRAVEL, CEMENT STABILIZATION, OR OTHER METHODS AS DIRECTED BY THE ENGINEER SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACKFILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, AND COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 6" MAXIMUM LIFTS. STRUCTURE BACKFILL MATERIAL SHALL BE SAND.

1 WATERLINE BEDDING DETAIL
NOT TO SCALE



2 TYPICAL GATE VALVE DETAIL
NOT TO SCALE

NOTES:
1. THRUST BLOCK AREAS SHOWN ARE BASE ON TEST PRESSURES OF 150 P.S.I. FOR 6"–12" PIPE AND 200 P.S.I. FOR 14"–16" PIPE AND SOIL BEARING PRESSURE OF 1000 PSF.

2. MINIMUM AREAS SHOWN ARE IN SQUARE FEET.

3. BEARING MUST BE ON UNDISTURBED EARTH.

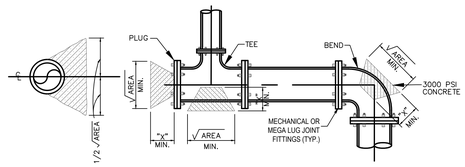
4. ADJUST THRUST BLOCK AREAS ACCORDINGLY IF PRESSURES AND\OR SOIL BEARING VALUE VARIES.

5. THRUST BLOCKING TO BE PLACED AT ALL DEAD ENDS AND TEES, AT ALL BENDS, AND OTHER AREAS WHICH MAY REQUIRE THRUST RESISTANCE AS APPROVED BY THE ENGINEER.

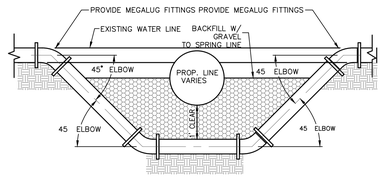
6. USE 3000 PSI CONCRETE.

"X" DIMENSION MAY VARY TO PROVIDE REQ'D BEARING AGAINST UNDISTURBED EARTH.

HORIZONTAL BLOCKING TABLE BEARING AREA OF BLOCK IN SQUARE FEET							
PIPE SIZE (IN)	DEAD END AND TEE	90° BEND	45° BEND	22.5° BEND	11.25° BEND	5° BEND	"X"–DIM FT.
6	4.24	6.00	3.25	1.65	0.83	0.37	1.00
8	7.54	10.66	5.77	2.94	1.48	0.66	1.00
10	11.78	16.66	9.02	4.60	2.31	1.03	1.25
12	16.96	23.99	12.98	6.62	3.33	1.48	1.25
14	30.79	43.54	23.56	12.01	6.04	2.69	1.50
16	40.20	56.67	30.78	15.69	7.88	3.51	1.75



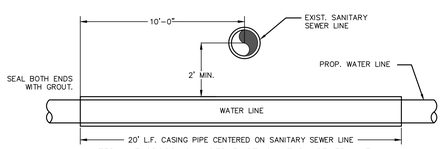
3 CONCRETE THRUST BLOCK DETAIL
NOT TO SCALE



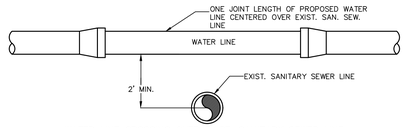
WATER LINE ADJUSTMENT PVC OR A.C.

NOTE:
ALL BENDS AND JOINTS MUST BE SUPPORTED BY A CONC. THRUST BLOCK, APPROVED EQUAL OR AS DIRECTED BY ENGINEER

4 WATER LINE ADJUSTMENT DETAIL
NOT TO SCALE



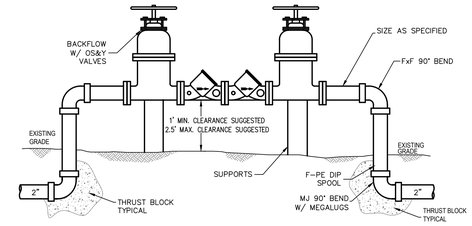
WATER LINE CROSSING UNDER EXIST. SANITARY SEWER LINE



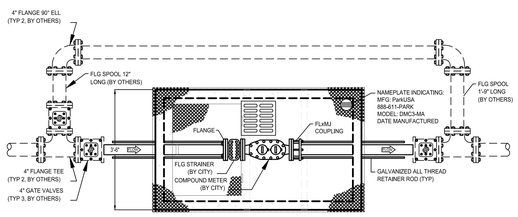
WATER LINE CROSSING OVER EXIST. SANITARY SEWER LINE

5 WATER LINE/SANITARY SEWER CROSSING DETAIL
NOT TO SCALE

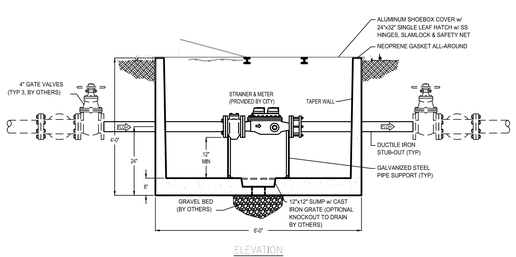
PROPOSED DOUBLE CHECK BACK FLOW PREVENTER TO BE APPROVED BY APPROPRIATE UTILITY ENTITY. (CITY OR WATER SUPPLY CORPORATION.) BACKFLOW PREVENTER SHALL HAVE AN ALUMINUM INSULATION JACKET, PRIME AND PAINT WITH APPROVED MARINE QUALITY PAINT.



6 2" DOUBLE CHECK BACKFLOW PREVENTER
NOT TO SCALE



PLAN VIEW



ELEVATION

Specifications

CONCRETE: Class I/II concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth.

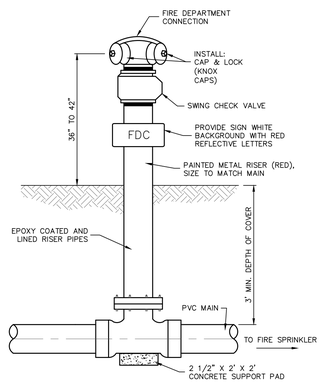
REINFORCEMENT: Grade 60 reinforced. Steel rebar conforming to ASTM A615 □n re□u□ed □en□r□□□ re□u□□

HATCHWAY: Aluminum diamond plate cover with extruded aluminum frame furnished with drop handle, open door support and slam lock. (Pedestrian Rated)

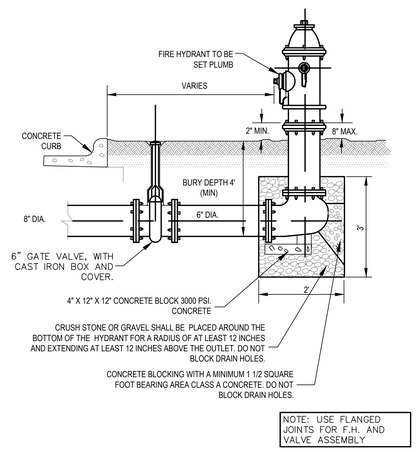
Engineering Data

The meter assembly shall be factory assembled in vault & hydrostatically tested prior to delivery. Field excavation & preparation shall be complete prior to delivery. Pipe, valves and fittings of the assembly shall be approved by one or more of the following associations:

7 4" DOMESTIC COMPOUND WATER METER ASSEMBLY W/BYPASS
BELOW GROUND
NOT TO SCALE



8 FIRE DEPARTMENT CONNECTION DETAIL
NOT TO SCALE



NOTES:

1. USE CAST IRON OR DUCTILE IRON VALVES AND FITTINGS

2. ALL CAST IRON OR DUCTILE IRON FITTINGS SHALL BE MECHANICAL JOINT-TYPE.

9 FIRE HYDRANT INSTALLATION DETAIL
NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
94594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

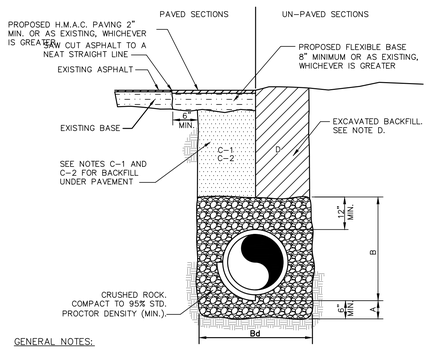
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	6/07/2019
REVISED	

C115
TYPICAL DETAILS

H:\TWG19101-Pharr Aquatics Facility\DESIGN\DWG\01_TWG19101_DET.dwg Jun 07, 2019 - 2:12pm



GENERAL NOTES:

A. CRUSHED ROCK BEDDING PLACED, HAND LEVELED, AND COMPACTED BEFORE PIPE IS LAID, UP TO BOTTOM OF PIPE (MIN. THICKNESS = 6").

B. CRUSHED ROCK BACKFILL PLACED AND COMPACTED AFTER PIPE IS LAID, FROM BOTTOM OF PIPE TO 12" ABOVE THE TOP OF PIPE. WORK IN UNDER PIPE HAUNCHES AND COMPACT BY HAND TO SPRING LINE. USE VIBRATORY-TYPE COMPACTORS FOR LIFTS ABOVE THE SPRING LINE. MAXIMUM 6" LIFTS.
Bd. MINIMUM TRENCH WIDTH: PIPE O.D. + 16" (FOR 16" PIPE AND SMALLER); PIPE O.D. X 1.25 + 12" (FOR 18" PIPE AND LARGER)

C-1. (CITY STREETS, PARKING AREA, AND DRIVEWAYS) SELECT EXCAVATED BACKFILL MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 8" MAX. LIFTS.

C-2 (STATE MAINTAINED ROADWAY) SAND/CEMENT STABILIZED BACKFILL WITH 7% PORTLAND CEMENT COMPACTED TO 95% STANDARD PROCTOR DENSITY.

D. EXCAVATED EARTH BACKFILL MECHANICALLY COMPACTED IN 12" MAX. LIFTS. MINIMUM STANDARD PROCTOR DENSITY: 90% OUTSIDE RIGHT OF WAY; 95% INSIDE RIGHT OF WAY

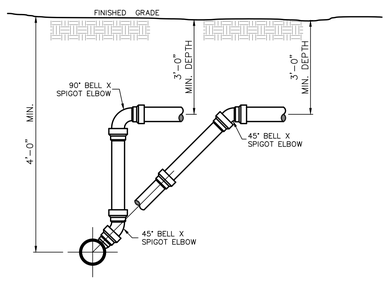
EMBEDMENT SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM D 2321. EMBEDMENT MATERIAL SHALL BE CLASS 1A (CRUSHED ROCK) OR 1B (CRUSHED ROCK-SAND MIXTURE) WITH LESS THAN 50% PASSING A No. 4 SIEVE. MAXIMUM ¾" SIZE FOR PIPE SIZE ≤ 15", GREATER THAN 90% OF CRUSHED ROCK SHALL HAVE AT LEAST THREE BROKEN FACES. NO MORE THAN 2% UNBROKEN FRACTION ALLOWED.

IN SATURATED OR UNSTABLE SOILS, EMBEDMENT SHALL BE CLASS 1B ONLY (SEE SPECIFICATIONS FOR GRADATION REQUIREMENTS).
WHERE THIS STANDARD CONFLICTS WITH THE RECOMMENDATION OF ANY GEOTECHNICAL REPORT, OBTAIN WRITTEN CLARIFICATION FROM THE UTILITY ENGINEER PRIOR TO CONSTRUCTION.

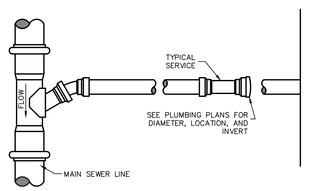
FOUNDATION PREPARATION USING COBBLES, GRAVEL, CEMENT STABILIZATION, OR OTHER METHODS AS APPROVED BY THE ENGINEER SHALL BE REQUIRED WHEN TRENCH BOTTOM IS UNSTABLE.

BACKFILLING AT STRUCTURES SHALL BE PLACED IN UNIFORM LAYERS, AND COMPACTED TO 95% STANDARD PROCTOR DENSITY IN 6" MAXIMUM LIFTS. STRUCTURE BACKFILL MATERIAL SHALL BE SAND.

1 SANITARY SEWER(NON-FORCEMAIN) PIPE BEDDING DETAIL
NOT TO SCALE

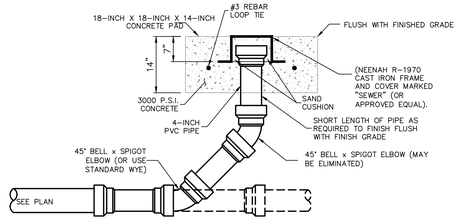


2 TYPICAL DEEP SANITARY SEWER SERVICE CONNECTION
NOT TO SCALE

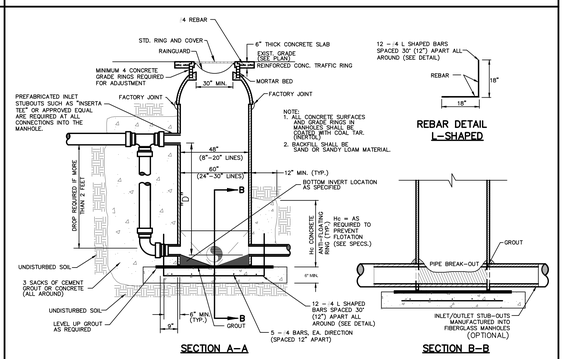


NOTE:
A SOUND DETECTION REFLECTOR "STUB-DEC-TA-CAL" BY GRIFFOLYN, INC. OR AN APPROVED SUBSTITUTE, WILL BE FASTENED TO THE END OF EACH SERVICE CONNECTION STUB TO FACILITATE LOCATION SERVICE STUBS.

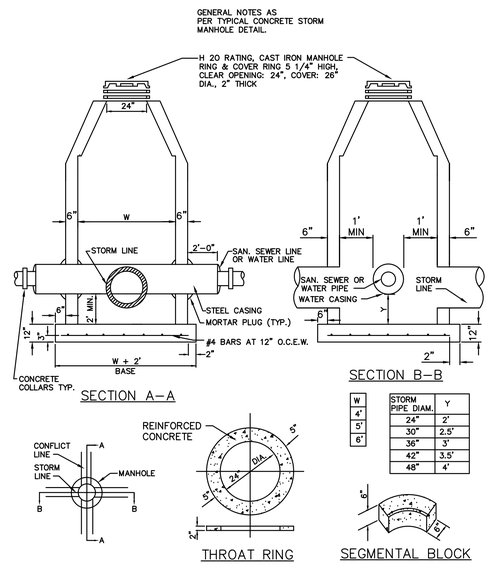
3 SINGLE SANITARY SEWER SERVICE
NOT TO SCALE



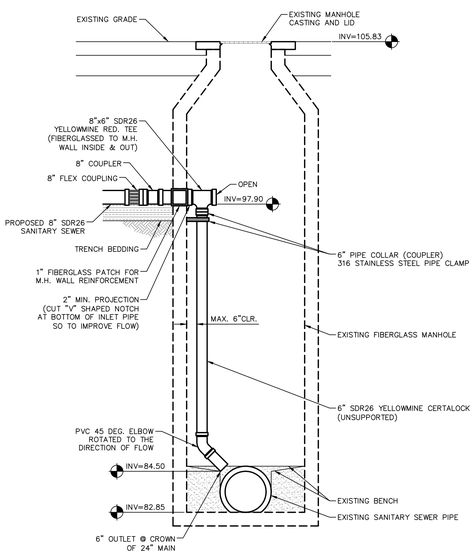
4 STANDARD EXTERIOR CLEANOUT
NOT TO SCALE



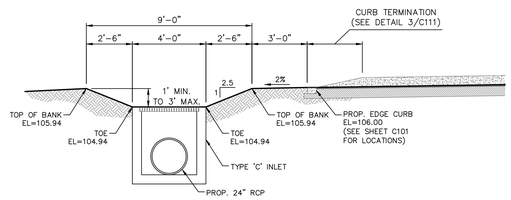
5 SAN. SEWER FIBERGLASS MANHOLE DETAIL
NOT TO SCALE



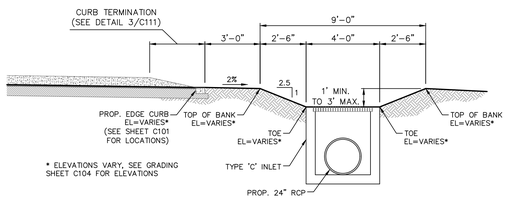
6 TYPICAL CONCRETE STORM CONFLICT MANHOLE DETAIL
NOT TO SCALE



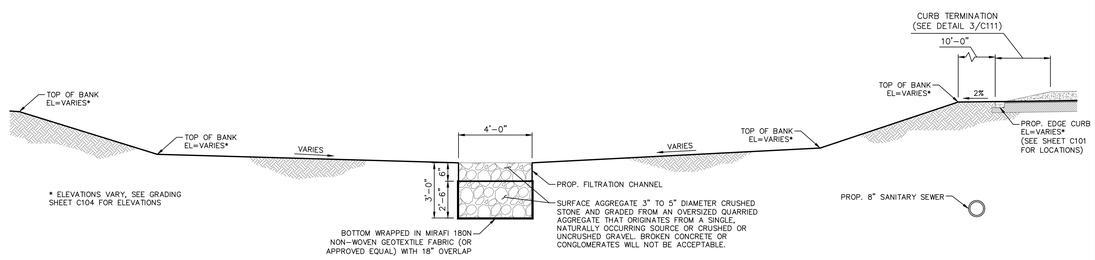
7 INTERNAL DROP CONNECTION DETAIL TO EXISTING MANHOLE (SIOUX ROAD)
NOT TO SCALE



8 WEST DETENTION SWALE CROSS SECTION
NOT TO SCALE



9 NORTH DETENTION SWALE CROSS SECTION
NOT TO SCALE



10 DETENTION POND WITH FILTRATION CHANNEL TYPICAL CROSS SECTION
NOT TO SCALE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
JORGE D. PEREZ
34594
REGISTERED
PROFESSIONAL ENGINEER
6/7/19

REVISION	DATE	APPROVED BY	DESCRIPTION

PCE Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482 fax (956) 682-1545

PROPOSED

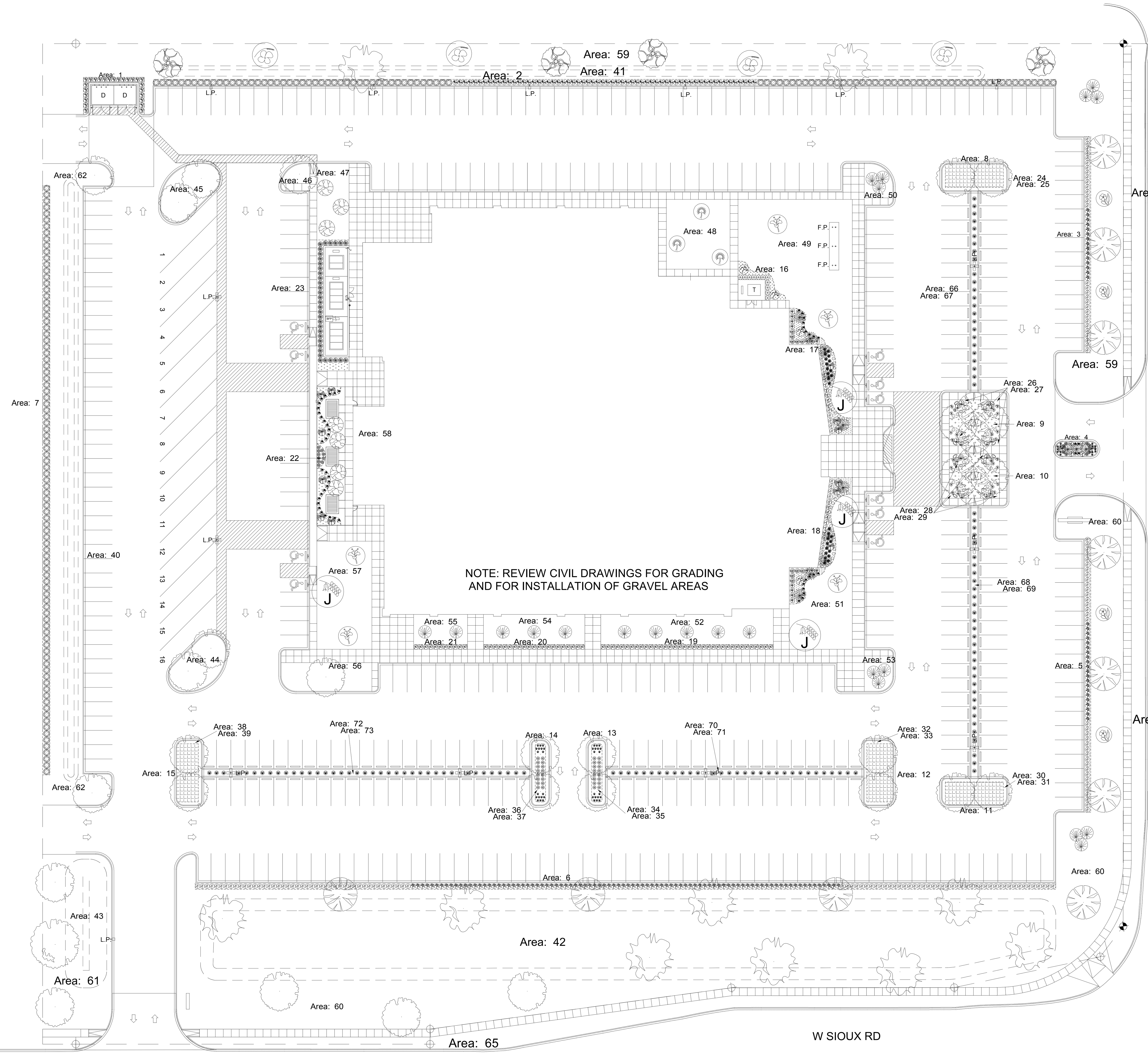
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 6/07/2019
REVISED

C116
TYPICAL DETAILS

Area 1: COMPOSITE, HARDWOOD
Area 2: COMPOSITE, HARDWOOD
Area 3: COMPOSITE, HARDWOOD
Area 4: COMPOSITE, HARDWOOD
Area 5: COMPOSITE, HARDWOOD
Area 6: COMPOSITE, HARDWOOD
Area 7: COMPOSITE, HARDWOOD
Area 8: COMPOSITE, HARDWOOD
Area 9: COMPOSITE, HARDWOOD
Area 10: COMPOSITE, HARDWOOD
Area 11: COMPOSITE, HARDWOOD
Area 12: COMPOSITE, HARDWOOD
Area 13: COMPOSITE, HARDWOOD
Area 14: COMPOSITE, HARDWOOD
Area 15: COMPOSITE, HARDWOOD
Area 16: COMPOSITE, HARDWOOD
Area 17: COMPOSITE, HARDWOOD
Area 18: COMPOSITE, HARDWOOD
Area 19: COMPOSITE, HARDWOOD
Area 20: COMPOSITE, HARDWOOD
Area 21: COMPOSITE, HARDWOOD
Area 22: COMPOSITE, HARDWOOD
Area 23: COMPOSITE, HARDWOOD
Area 24: GRANITE Decomposed
Area 25: WEED MAT
Area 26: GRANITE Decomposed
Area 27: WEED MAT
Area 28: GRANITE Decomposed
Area 29: WEED MAT
Area 30: GRANITE Decomposed
Area 31: WEED MAT
Area 32: GRANITE Decomposed
Area 33: WEED MAT
Area 34: GRANITE Decomposed
Area 35: WEED MAT
Area 36: GRANITE Decomposed
Area 37: WEED MAT
Area 38: GRANITE Decomposed
Area 39: WEED MAT
Area 40: FLORITAM SOD
Area 41: FLORITAM SOD
Area 42: FLORITAM SOD
Area 43: FLORITAM SOD
Area 44: FLORITAM SOD
Area 45: FLORITAM SOD
Area 46: FLORITAM SOD
Area 47: FLORITAM SOD
Area 48: FLORITAM SOD
Area 49: FLORITAM SOD
Area 50: FLORITAM SOD
Area 51: FLORITAM SOD
Area 52: FLORITAM SOD
Area 53: FLORITAM SOD
Area 54: FLORITAM SOD
Area 55: FLORITAM SOD
Area 56: FLORITAM SOD
Area 57: FLORITAM SOD
Area 58: FLORITAM SOD
Area 59: BERMUDA HYDRO MULCH
Area 60: BERMUDA HYDRO MULCH
Area 61: BERMUDA HYDRO MULCH
Area 62: BERMUDA HYDRO MULCH
Area 63: BERMUDA HYDRO MULCH
Area 64: BERMUDA HYDRO MULCH
Area 65: BERMUDA HYDRO MULCH
Area 66: GRAVEL, 1 INCH
Area 67: WEED MAT
Area 68: GRAVEL, 1 INCH
Area 69: WEED MAT
Area 70: GRAVEL, 1 INCH
Area 71: WEED MAT
Area 72: GRAVEL, 1 INCH
Area 73: WEED MAT



CITY OF PHARR PARKING LOT CALCULAITON:

SFT OF LANDSCAPING PER STALL 18 SFT X 411 = 7,398 SFT
OF LANDSCAPE AREA

7,398 SFT / 600 = 13 UNITS

13 Units x 2 Tree = 26 TREES — 13 UNITS x 4 Shrubs = 52 SHRUBS

CITY OF PHARR STREET TREE CALCULAITON:

LOT FRONTAGE LINEAR FT 1,271 LFT / 50 = 26 Trees
STREET TREES MAY COUNT TOWARDS THE PRIMARY LANDSCAPE

CITY OF PHARR LANDSCAPE CALCULAITON:

IMPERVIOUS COVERAGE 286,570 S.F. X 15% = 42,986 SFT
OF LANDSCAPE AREA

42,986 SFT / 1000 = 43 UNITS

43 UNITS x 2 Tree = 86 TREES
> 86 Trees Provided

43 UNITS x 4 Shrubs = 176 SHRUBS
> 176 Shrubs Provided

CITY OF PHARR TREE CANOPY CALCULAITON:

TOTAL LOT AREA 400,433 SFT X 10% = 40,043 SFT
OF TREE CANOPY AT MATRURE GROWTH

COMMON NAME OF TREE	MATURE CANOPY S.F.	QUANTITY OF TREES
3" Live Oak	1,256 SFT	29 x 1,256 = 36,424
3" FAN-TEX ASH	1,256 SFT	1 x 1,256
3" Cedar Elm	710 SFT	14 x 710 = 9,940
3" Mesquite	710 SFT	4 x 710 = 2,840
3" Wild Olive	710 SFT	4 x 710 = 2,840
8' Crape Myrtle	79 SFT	7 x 79 = 553
6-12' Washingtonia Palm	79 SFT	22 x 79 = 1,738
2.5" Retama	710 SFT	4 x 710 = 2,840
3" Royal Poinciana	710 SFT	5 x 710 = 3,550
3" Jacaranda	710 SFT	4 x 710 = 2,840
3" Mesquite	710 SFT	4 x 710 = 2,840
10' Queen Palm	79 SFT	13 x 79 = 1,027
6' TX Sabal	79 SFT	3 x 79 = 237
3" Mont. Cypress	1,256 SFT	10 x 1,256 = 12,560
		TOTAL: 81,485 SFT

Landscaping Specifications:

* The Landscape contractor shall furnish all materials and perform all work in accordance with these specifications, drawings and instructions.

> Planted material shall be of excellent quality and conform with the requirements of the American Standard for Nursery stock as per US-AAN. Plants shall be fully rooted and container cured. Unless otherwise stated no bare root material except for large caliper trees is acceptable.

> All plants shall be of specimen quality and symetrical. They shall have a normal habit and be vigorous, sound and healthy with no desease, insects, eggs or larvea present.

> Caliper of trees shall be measured 4 feet above the ground.

> Plants specified with a range such as 2 to 2.5 feet, shall meet the minimum specification, and not exceed the maximum specification, so as to provide a uniform appearance.

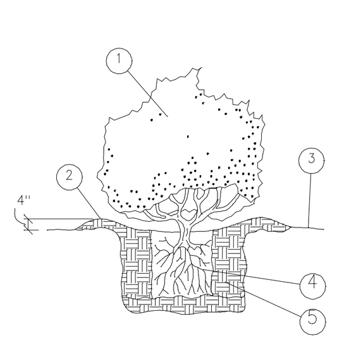
> Soil ammendments shall be as specified and free of contamination by debris, roots, rocks and toxic materials. Topsoil shall be friable sandy loam, dark in color and of a fine texture.

> The Landscape contractor shall be responsible for the care and watering of the materials whether installed or stored, for the duration of the installation period. Upon completion of the installation the Landscape contractor shall provide a formal letter transfering responsibility to the Owner.

Quantity	Symbol	Description	Plant Size
4		MESQUITE	3 inch caliper
7		CRAPE MYRTLE	2.5" Caliper Container 8 FT
4		PALM, WASHINGTONIA	8 FT TRK HT
14		PALM, WASHINGTONIA	10 FT TRK HT
4		PALM, WASHINGTONIA	12 FT TRK HT
1		ASH, FAN-TEX	3 inch caliper container
14		CEDAR ELM	3 inch caliper container
4		WILD OLIVE	3 inch caliper
29		OAK, LIVE	3 inch caliper container
4		RETAMA	2.5 inch caliper
5		ROYAL POINCIANA	3 inch caliper container
4	J	JACARANDA	3 inch caliper container
15		PALM, PHOENIX ROEBELENII	15 gallon
13		PALM, Queen (COCOAS PLUMOSA)	10 FT TRK HT
4		JATROPHA	30 gallon
3		PALM, SABAL, TEXAS	6 FT TRK HT
10		CYPRESS, MONTEZUMA	3 inch caliper container
126		SAGE, Green Cloud	3 gallon
32		HAWTHORN, Indian dwarf	3 gallon
80		YAUPON HOLLY, DWARF	3 gallon
62		DURANTA	3 gallon
14		BOUGAINVILLEA, Dwarf	3 gallon
187		BOUGAINVILLEA	3 gallon
11		VIBURNUM	3 gallon
10		HIBISCUS	3 gallon
25		OLEANDER, DWARF	3 gallon
175		FIRECRACKER BUSH	3 gallon
68		IXORA	3 gallon
52		IXORA, DWARF	3 gallon
278		CARISSA, GREEN CARPET	3 gallon
1005		JASMINE, Asiatic	4 inch pots
18		BIRD OF PARADISE. Dwarf	3 gallon
18		LANTANA	1 gallon
50		IRIS, African	1 gallon
26		Padre Island Mist Flower	1 gallon
1205		WEDELLEA	4 inch pots
35		GREEN ISLAND FICUS	3 gallon
126		MUHLY GRASS	3 gallon
16		YUCCA, RED	3 gallon
24		RED CROWN OF THORNS	5 gallon
8		BOULDER	
3,500	—	Aluminum Edging	

0 20 40 80 120

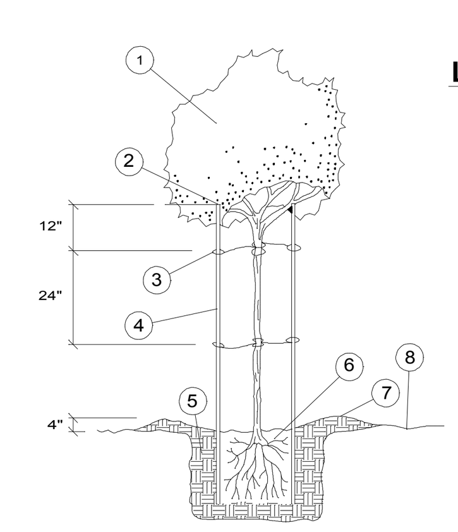
1" = 40'



LEGEND

1. Shrub per plan
2. Water basin
3. Finished grade
4. Container grown root zone,
5. Loosened base with composite

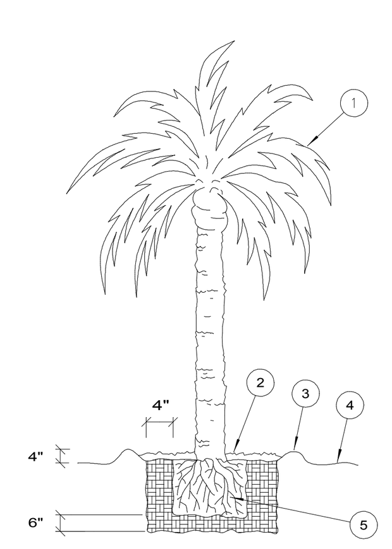
SHRUB PLANTING



LEGEND

1. Tree per plan
2. Allow clearance from branching
3. Soft PVC coated guy wire
4. 6 ft. T post
5. Lossened base
6. Container root zone
7. Water basin
8. Finished grade

TREE PLANTING



LEGEND

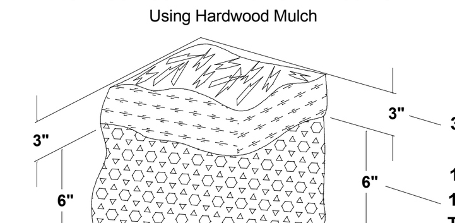
1. PALM TREE PER PLAN
2. 2" LAYER OF WOOD CHIP MULCH
3. EARTH WATERING BASIN (RAKE SMOOTH PRIOR TO SEEDING IN HYDROSEED AREAS; AT END OF PLANT ESTABLISHMENT PERIOD FOR ALL REMAINING BASINS)
4. FINISH GRADE
5. ROOTBALL (SET TOP OF ROOTBALL 3"-6" BELOW FINISH GRADE OR PER LANDSCAPE ARCHITECT IN FIELD)

NOTE:

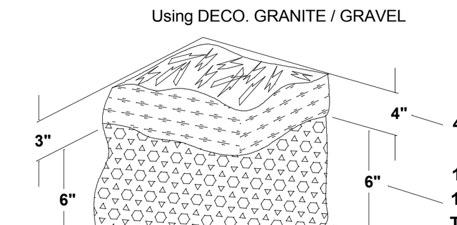
ALL BACKFILL TO BE WATER JETTED DURING PLANTING FOR MAXIMUM STABILITY

PALM TREE PLANTING

COMPOSIT SOIL PREP. & TOP DRESSING
Using Hardwood Mulch



COMPOSIT SOIL PREP. & TOP DRESSING
Using DECO. GRANITE / GRAVEL



DESCRIPTION	NOTES	QUANTITY
PREMIUM COMPOST	2" LAYER PREMIUM COMPOST TILL TO 6" DEPTH	102 CY
SCREENED TOP SOIL	4" FOR ALL PLANTING AREAS (IF STOCKPILED SOIL IS NOT QUALITY NOR AVAILABLE)	204 CY
MULCH (HARDWOOD)	3" MIN. (TEXAS NATIVES SHREDDED HARDWOOD MULCH)	4,125 CFT
HERBICIDE	ALL PLANTING BED AREAS AS SPECIFIED	16,500 SFT
FERTILIZER	ALL PLANT MATERIAL PER DETAIL	16,500 SFT
PLANTING TABLETS	PER DETAIL AS SPECIFIED	-
PRE-EMERGENT	ALL PLANTING BED AREAS	16,500 SFT
GUYING AND STAKING	ALL TREES/PALMS WITH SAFE-T CAPS ON POSTS PER DETAIL	-
ALUMINUM EDGE	1/8"x5" SURE-LOC ALUMINUM EDGING OR EQUAL	3,500 LFT
IRRIGATION SYSTEM	COMPLETE AUTOMATIC IRRIGATION SYSTEM PER PLANS/DETAILS BY L.I.C.	-
HYDROMULCH	BERMUDA HYDROMULCH	59,000 SFT
WEED MAT	PROFESSIONAL GRADE WEED MAT	4,700 SFT
DECO GRANITE	DECOMPOSED GRANITE @ 4" DEPTH (FINE CRUSH)	600 CFT
GRAVEL	GRAVEL 1" @ 6" DEPTH	1,400 CFT
FLORITAM	FLORITAM SOD CERTIFIED #1	6,900 SY

EARTH IRRIGATION
& LANDSCAPING INC.

1101 E. Violet St.
McALLEN, TEXAS 78504
PH. 956 631 6686 FAX. 956 631 6688

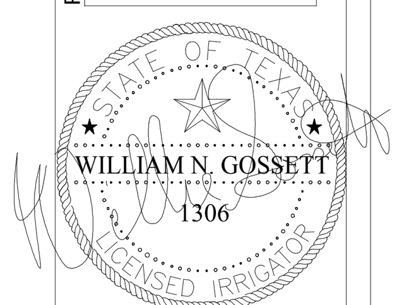
Revision Number	Revision Date
Approved by	Attachments

Company Information

EARTH IRRIGATION
& LANDSCAPING INC.
1101 E. VIOLET ST. McALLEN, TX 78504
PH. 956 631 6686 FAX 956 631 6688

LANDSCAPE PLAN

PROJECT TITLE
Pharr Aquatic Center
Pharr, TX

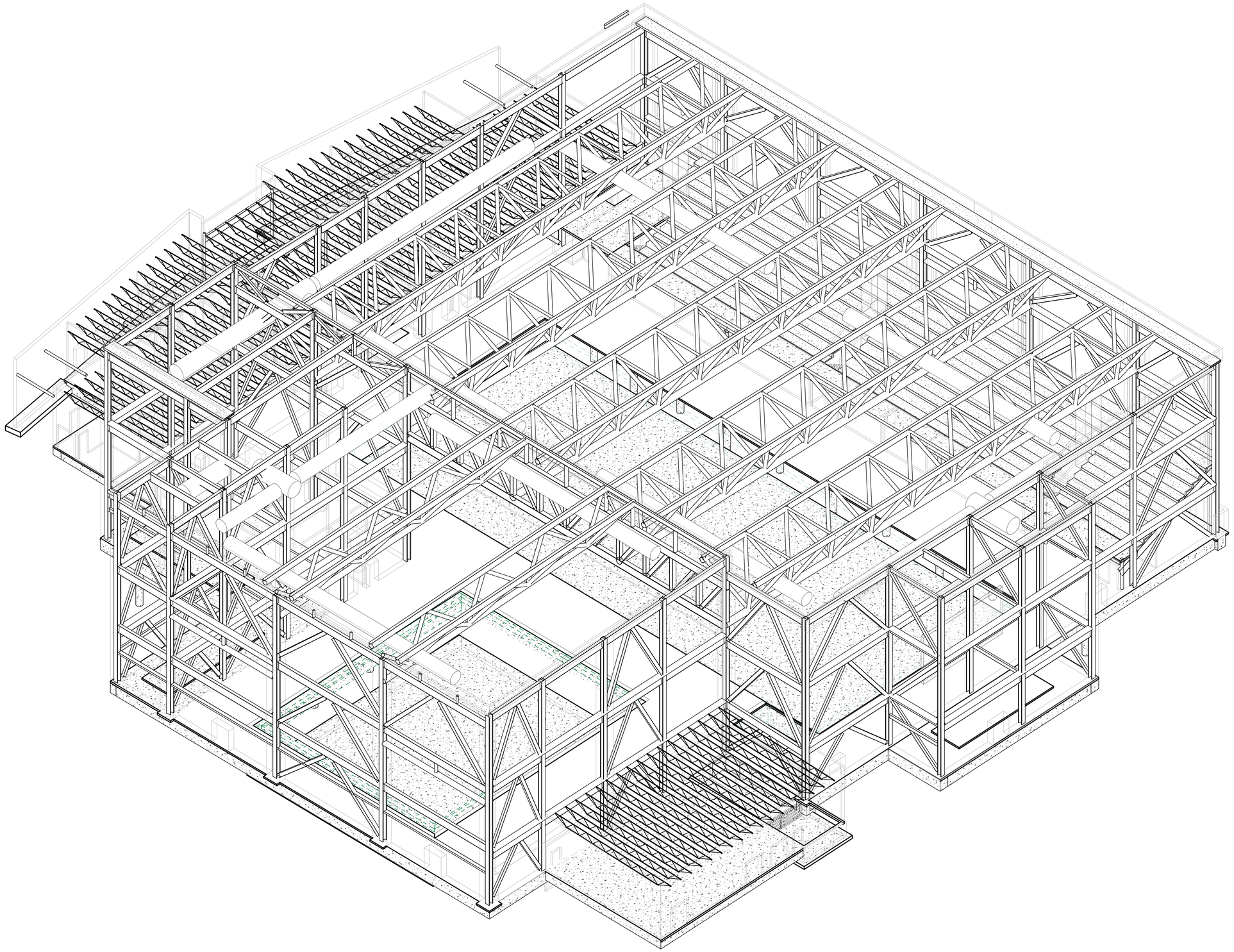


ADEQUACY OF THE WORK OF THE LANDSCAPE IRRIGATOR.
THE TEXAS COMMISSION OF ENVIRONMENTAL QUALITY
P.O. BOX 13087
AUSTIN, TEXAS 78711-3087
TELEPHONE (512) 305-8534
HAS JURISDICTION OVER INDIVIDUALS LICENSED UNDER THE TEXAS WATER CODE, CHAPTER 34

Seal

DATE: 4/12/2019
FILE:
DRAWN BY: JT
SCALE: 1" = 40'
SHEET: L1.0

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F-1615



THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS NOT TO BE USED. ANY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Overall

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S100

6/11/2019 12:01:52 PM H:\Shavelle\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\stru\r18323 WG aquatic center_ 100_CD_06_10_2019.rvt

GENERAL NOTES

1. THIS CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE, UNLESS OTHERWISE INDICATED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE, WORKMEN, AND OTHER PERSONS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR EARTH BANKS, FORMS, SCAFFOLDING, PLANKING SAFETY NETS, SUPPORT AND BRACING FOR CRANES, POLES, ETC. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND HE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT OR THE ENGINEER DO NOT INCLUDE INSPECTION OF THE ABOVE AND BELOW ITEMS.
2. ALL CONSTRUCTION AND QUALITY OF MATERIALS SHALL COMPLY WITH THE GOVERNING BUILDING CODES AND REGULATIONS.
3. THE CONTRACTOR SHALL Verify ALL DIMENSIONS, ELEVATIONS, TOLERANCES AND CONDITIONS AT THE JOB SITE BEFORE COMMENCEMENT OF WORK AND SHALL IMMEDIATELY REPORT ANY DISCREPANCIES OR OMISSIONS TO THE ARCHITECT AND ENGINEER IN WRITING. ANY OMISSION OR CONFLICT BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND/OR SPECIFICATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH ANY WORK SO INVOLVED.
4. IN CASE OF CONFLICT; NOTES AND DETAILS ON THE BALANCE OF THE DRAWINGS TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. DRAWINGS TAKE PRECEDENCE OVER SPECIFICATIONS.
5. WHERE CONSTRUCTION DETAILS ARE NOT SPECIFICALLY SHOWN OR NOTED FOR ANY PART OF THE WORK, SUCH DETAILS SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS SHOWN FOR SIMILAR CONDITIONS AND MATERIALS. WHERE SUFFICIENTLY SIMILAR WORK IS NOT SHOWN, THE ENGINEER SHALL BE CONSULTED FOR CLARIFICATION.
6. EACH SUBCONTRACTOR IS CONSIDERED AN EXPERT IN HIS RESPECTIVE FIELD AND SHALL PRIOR TO THE SUBMISSION OF A BID OR PERFORMANCE OF WORK, NOTIFY THE GENERAL CONTRACTOR, ARCHITECT, ENGINEER OR OWNER, IN WRITING OF ANY WORK CALLED OUT ON THE DRAWINGS IN HIS TRADE THAT CANNOT BE GUARANTEED OR PERFORMED AS INDICATED.
7. THE CONTRACTOR SHALL COORDINATE ALL MECHANICAL AND ELECTRICAL EQUIPMENT, AS TO WEIGHTS AND EXACT LOCATIONS, WITH STRUCTURAL SUPPORTS. IN THE EVENT THAT THE PURCHASED EQUIPMENT DEVIATES IN WEIGHT AND LOCATION FROM THOSE INDICATED ON THE PLANS, THE ARCHITECT AND ENGINEER MUST BE NOTIFIED AND APPROVAL OBTAINED PRIOR TO INSTALLATION.
8. THIS STRUCTURE IS DESIGNED AS A STABLE UNIT AFTER ALL COMPONENTS ARE IN PLACE. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE TEMPORARY BRACING AS REQUIRED TO INSURE THE VERTICAL AND LATERAL STABILITY OF THE ENTIRE STRUCTURE, OR ANY PORTION THEREOF, DURING CONSTRUCTION.
9. NEITHER THE OWNER NOR THE ARCHITECT NOR THE ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS. THE CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
10. TRADE NAMES AND MANUFACTURERS REFERRED TO ARE FOR QUALITY STANDARDS ONLY. SUBSTITUTIONS WILL BE PERMITTED AS APPROVED BY THE ENGINEER.
11. ANY OPTIONS OR APPROVED SUBSTITUTIONS ARE FOR CONTRACTORS CONVENIENCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CHANGES, ADDITIONAL COSTS (INCLUDING REDESIGN BY THE ENGINEER), AND COORDINATION WITH ALL ITEMS THAT THE SUBSTITUTIONS MAY IMPACT.
12. THE ARCHITECT AND ENGINEER ARE TO BE NOTIFIED IN WRITING WHEN CONSTRUCTION AT THE SITE BEGINS.
13. ANY QUESTIONS RELATED TO INTERPRETATION OR INTENT OF THESE DRAWINGS SHALL BE REFERRED TO THE ENGINEER.
14. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO LOCATE AND PROJECT ANY EXISTING UNDERGROUND OR CONCEALED CONDUIT, PLUMBING, OR OTHER UTILITIES PRIOR TO BEGINNING ANY WORK.
15. PIPES, DUCTS, SLEEVES, CHASES, ETC. SHALL NOT BE PLACED IN BEAMS OR WALLS UNLESS SPECIFICALLY SHOWN OR NOTED. NOR SHALL ANY STRUCTURAL MEMBER BE CUT FOR PIPES, DUCTS, ETC. UNLESS NOTED CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FOR INSTALLATION OF ANY ADDITIONAL PIPES, DUCTS, ETC.

DESIGN CRITERIA

DESIGN LOADS, STRUCTURAL ANALYSIS AND PREPARATIONS OF STRUCTURAL MEMBERS ARE BASED UPON THE FOLLOWING CRITERIA:

1. CODE: IBC 2015
2. LATERAL LOADS
   - A. WIND SPEED (V_{3s}): 145 MPH
   - B. EXPOSURE CATEGORY: C
   - C. IMPORTANCE FACTOR: 1.0
   - D. BUILDING CATEGORY: III
   - E. SEISMIC DESIGN CATEGORY: A
   - F. SITE CLASS: C
   - G. SEISMIC COEFFICIENTS: C
     - Ss 0.041 g
     - S1 0.014 g
     - Fa 1.6
     - Fv 2.4
     - Sms 0.066 g
     - Sm1 0.034 g
     - Sds 0.044 g
     - Sd1 0.023 g
3. VERTICAL LOADS
   - ROOF:
     - A. COLLATERAL LOAD: 0 PSF
     - B. DEAD LOAD: ACTUAL WEIGHT PSF
     - C. LIVE LOAD: (REDUCIBLE) 20 PSF
     - D. WIND UPLIFT LOAD (NET): AS CALCULATED BY SUB-CONTRACTOR PSF
     - E. GROUND SNOW LOAD: 0 PSF
     - F. CRANE LOADS: NONE
     - G. MECHANICAL UNITS: SEE Mechanical PLANS
   - FLOOR:
     - A. DEAD LOAD: 85 PSF
     - B. LIVE LOAD, OFFICE: 100 + 20 PSF
     - C. LIVE LOAD, LIGHT STORAGE 125 PSF
     - D. LIVE LOAD, HEAVY STORAGE: 250 PSF
     - E. LIVE LOAD, ROOMS 80 PSF
     - F. LIVE LOAD, CORRIDOR: 100 PSF
     - G. MECHANICAL UNITS SEE mechanical PLANS
4. SUBSURFACE INFORMATION
   - A. PREPARED BY: Raba Kistner, March 6, 2019 AMA19-006-00
   - B. SHALLOW FOUNDATION
     - MINIMUM FOOTING DEPTH: 24 INCHES
     - MINIMUM FOOTING WIDTH: 12 INCHES
     - ALLOWABLE BEARING PRESSURE (CONTINUOUS FOOTINGS): 1900 PSF
     - ALLOWABLE BEARING PRESSURE (ISOLATED FOOTINGS): 2300 PSF
     - WIRE REINFORCEMENT INSTITUTE (WRI) CRITERIA
     - CLIMATIC RATING (Cw) 15
     - EFFECTIVE PLASTICITY INDEX (UNDISTURBED, NATIVE SOIL) 34
     - EFFECTIVE PLASTICITY INDEX (SITE IMPROVED SOIL) 34
     - PVR (UNDISTURBED SOIL) 1.75 INCHS
     - PVR (WITH SITE IMPROVEMENT) 1.0 INCH

Sheet List	
Sheet Number	Sheet Name
S100	Overall
S101	General Notes
S102	General Notes
S103	Schedules
S201	Pier Layout Plan
S202	Foundation Plan
S203	Foundation Plan, Grade Beams
S204	Column Layout Plan
S205	Misc. Structures
S206	Monument Sign, Framing Details
S207	Monument Sign Sections and Elevations
S301	Beachers and Observation Framing Plans
S302	Roof Framing Plan
S303	High Roof Framing Plan
S431	Typical Concrete Details
S432	Foundation Details
S433	Foundation Details
S434	Hollow Core Planks Details
S441	Typical CMU Details
S452	Steel Framing Details
S453	Typical Details
S551	Truss Details
S552	Truss Details
S601	Elevations
S602	Elevations
S603	Elevations
S604	Elevations
S605	Building Sections
S606	Building Sections
S607	Building Sections
S608	Building Sections

SHOP DRAWINGS AND SUBMITTALS

1. SHOP DRAWINGS SHALL BE PREPARED AND SUBMITTED FOR REVIEW TO THE ENGINEER FOR EACH STRUCTURAL BUILDING MATERIAL AS INDICATED IN THE STRUCTURAL GENERAL NOTES AND THE CONTRACT SPECIFICATIONS. SEE THE CONTRACT SPECIFICATIONS FOR SUBMITTAL PROCEDURES AND ADDITIONAL INFORMATION
2. SHOP DRAWINGS SHALL USE DRAFTING LINE WORK AND LETTERING THAT IS CLEARLY LEGIBLE. SHOP DRAWINGS SHALL NOT CONTAIN NO REPRODUCTIONS OF THE CONTRACT DRAWING PLANS OR DETAILS.
3. SUBMIT SHOP DRAWINGS IN PDF FORMAT.
4. SHOP DRAWINGS SHALL NOT SHOW MATERIALS FOR MORE THAN ONE LEVEL OF THE SAME PLAN.
5. SHOP DRAWINGS SHALL SHOW CLEAR AND COMPLETE INFORMATION FOR THE FABRICATION (DETAIL SHEETS AND/OR MATERIAL LISTS) AND INSTALLATION.
6. ALLOW A MINIMUM OF (2) WEEKS FOR REVIEW OF EACH SET OF SHOP DRAWINGS.
7. CONTRACTOR SHALL REVIEW THE SHOP DRAWINGS SUBMITTED BY THE SUB-CONTRACTOR AND COORDINATE SHOP DRAWINGS WITH ALL OTHER TRADING.
8. CONTRACTOR SHALL ANSWER ALL QUESTIONS OR CLARIFICATIONS BY THE SUB-CONTRACTOR BEFORE SUBMITTING TO ENGINEER FOR REVIEW. ANY QUESTIONS THAT THE CONTRACTOR CANNOT ANSWER WITH THE INFORMATION ON THE DRAWINGS SHALL CLEARLY BE MARKED FOR THE ENGINEER FOR REVIEW.
9. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS, SEE NOTE NUMBER 3 UNDER GENERAL NOTES.
10. REVIEW OF SHOP DRAWINGS BY THE ENGINEER IS FOR GENERAL CONFORMANCE TO THE STRUCTURAL DRAWINGS. REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER DOES NOT RELIEF THE CONTRACTOR FOR ANY ERRORS IN DIMENSIONS OR MATERIALS INDICATED ON THE SHOP DRAWINGS.
11. IF THERE IS ANY DISCREPANCY BETWEEN THE STRUCTURAL DRAWINGS AND SHOP DRAWINGS, THE INFORMATION SHOWN ON THE STRUCTURAL DRAWINGS GOVERN. INFORMATION THAT IS NOT INDICATED ON THE SHOP DRAWINGS SHALL BE OBTAINED FROM THE STRUCTURAL DRAWINGS.
12. PROVIDE SUBMITTALS FOR THE FOLLOWING ITEMS:

ITEM	REQUIRED
A. CONCRETE MIX DESIGN	X
B. CURING COMPOUND FOR CONCRETE	X
C. REINFORCING STEEL	X
D. STRUCTURAL STEEL	X
E. STEEL JOIST	X
F. METAL DECKING (INDICATE LAYOUT AND TYPES OF DECK PANELS, ANCHORAGE DETAILS, REINFORCING CHANNELS, PANS, DECK OPENINGS, SPECIAL JOINTING, ACCESSORIES, AND ATTACHMENTS TO OTHER CONSTRUCTION.)	X
G. Metal Canopies (INCLUDE CALC'S & REACTIONS)	X
H. Metal Studs	X
I. Hollow core Planks and Precast Concrete Beachers, include connection details	X

REINFORCING STEEL

1. BAR REINFORCEMENT SHALL CONFORM TO THE FOLLOWING GRADES OF ASTM A615, INCLUDING SUPPLEMENT S1. GRADE 40 - #3 AND SMALLER GRADE 60 - #4 AND LARGER.
2. DETAILS OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE AMERICAN CONCRETE INSTITUTE (ACI) 318, UNLESS OTHERWISE NOTED.
3. VERTICAL REINFORCEMENT SHALL BE TIED OR OTHERWISE FIXED IN POSITION AT THE TOP AND BOTTOM AND AT INTERMEDIATE LOCATIONS, SPACED NOT GREATER THAN 192 BAR DIAMETERS OR 48" O.C. WHICH EVER IS LESS. IN MASONRY CONSTRUCTION, THE REINFORCEMENT SHALL BE SECURED IN PLACE WITH REBAR SPACERS AND SHALL NOT BE SPACED APART MORE THAN 48 INCHES ON CENTER.
4. WELDED STEEL WIRE FABRIC REINFORCEMENT SHALL CONFORM TO ASTM A185.
5. WALLS, PILASTER, COLUMNS SHALL BE DOWELED TO THE SUPPORTING FOOTINGS WITH REINFORCEMENT OF THE SAME SIZE, GRADE AND AT THE SAME SPACING AS THE VERTICAL REINFORCEMENT IN THE WALLS, PILASTER, OR COLUMNS.
6. BAR SUPPORTS SHALL BE PROVIDED IN ACCORDANCE WITH THE PROVISIONS OF "BAR SUPPORT SPECIFICATIONS" AS CONTAINED IN THE LATEST EDITION OF THE "MANUAL OF STANDARD PRACTICE" BY THE CONCRETE REINFORCING STEEL INSTITUTE (CRSI). PLASTIC CHAIRS ARE NOT ALLOWED. FOR SLAB ON GRADE AND GRADE BEAMS, USE CONCRETE BRICK CHAIRS.
7. REINFORCING STEEL DETAILING, BENDING AND PLACING SHALL BE IN ACCORDANCE WiTH THE CONCRETE REINFORCING STEEL INSTITUTE "MANUAL OF STANDARD PRACTICE", LATEST EDITION.
8. ALL REINFORCEMENT SHALL BE SECURELY TIED IN PLACE BEFORE PLACING CONCRETE OR GROUT; INCLUDING EXTERIOR DOWELS FOR CMU OR CONCRETE WALLS.
9. PROVIDE CORNER BARS TOP AND BOTTOM AT ALL BEAM CORNERS AND DEAD END BEAM INTERSECTIONS. BARS TO EQUAL SIZE AND QUANTITY OF THE NOTED BEAM STEEL. BARS SHALL LAP BEAM REINFORCEMENT 40 BAR DIAMETERS.
10. BARS DETAILED AS CONTINUOUS SHALL BE LAPPED 40 BAR DIAMETERS AT SPLICES.
11. EXTEND THE SLAB REINFORCING STEEL, PERPENDICULAR TO BEAM, TO THE TOP OUTSIDE REINFORCING BAR OF PERIMETER BEAMS. START THE SLAB REINFORCING STEEL, PARALLEL TO BEAM, NOT MORE THAN 6" FROM THE TOP INSIDE REINFORCING BAR OF PERIMETER BEAMS.
12. PROVIDE #4 "Z" BARS AT 12" ON CENTER WHERE THE SLAB STEPS DOWN MORE THAN 3". THE "Z" BARS SHALL LAP THE MAIN SLAB REINFORCING STEEL 40 BAR DIAMETERS.
13. ALL CONDUIT OR PLUMBING LINES IN SLAB SHALL BE PLACED BELOW SLAB REINFORCING. ALL CONDUIT TO BE NO GREATER THAN 1" DIAMETER AND TO BE PLACED IN CENTER OF SLAB. NO PLUMBING LINES GREATER THAN 1 INCH ALLOWED IN THE SLAB.
14. WELDING OF CROSSING BARS AND TACK WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED.
15. WELDING OF REINFORCING STEEL, IF PERMITTED BY THE STRUCTURAL ENGINEER, SHALL BE PERFORMED IN ACCORDANCE WiTH THE "STRUCTURAL WELDING CODE REINFORCING STEEL" ON THE AMERICAN WELDING SOCIETY, AWS D1.4-96 AS INCORPORATED IN CBC CHAPTER No. 19, AND BY CERTIFIED WELDERS QUALIFIED USING PROCEDURES CONTAINED THEREIN, E70XX ELECTRODES SHALL BE USED IN WELDING GRADE 60 REINFORCEMENT. REINFORCEMENT SHALL NOT BE WELDED UNTIL A CHEMICAL ANALYSIS SUFFICIENT TO DETERMINE THE CARBON EQUIVALENT (C.E.) IS PERFORMED. THE C.E. OF REINFORCING STEEL SHALL BE CALCULATED FORM THE CHEMICAL COMPOSITION AS SHOWN IN THE MILL TEST REPORT. IF MiLL TEST REPORTS ARE NOT AVAILABLE, A CHEMICAL ANALYSIS SHALL BE MADE ON REINFORCEMENT REPRESENTATIVE OF THOSE TO BE WELDED. THE C.E. SHALL NOT EXCEED 0.55 AS CALCULATED PER IBC CHAPTER 19, A COPY OF THE MiLL TEST OF REINFORCING STEEL IN CONCRETE MEMBERS. (SPECIAL INSPECTION IS REQUIRED FOR ALL FIELD WELDING).
16. CONTRACTOR SHALL SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW BEFORE FABRICATION AND INSTALLATION.
17. CONCRETE COVER FOR REINFORCING AS FOLLOWS:

EXPOSURE CONDITION	MINIMUM COVER	TOLERANCE
DRILLED PIERS, FOOTINGS AND OTHER PRINCIPAL STRUCTURAL MEMBERS IN WHICH CONCRETE IS DEPOSITED AGAINST GROUND:	3"	3/8"
WHERE CONCRETE SURFACES, AFTER REMOVAL OF FORMS, ARE EXPOSED TO WEATHER OR GROUND:		
FOR BARS 5/8" IN DIAMETER	2"	1/4"
FOR BARS 5/8" OR LESS IN DIAMETER	1 1/2"	1/4"
WHERE SURFACES ARE NOT DIRECTLY EXPOSED TO WEATHER OR GROUND:		
FOR SLAB ON GRADE (FROM TOP OF SLAB)	1 1/2"	1/4"
FOR BEAMS, COLUMNS	1 1/2"	1/4"
FOR JOISTS AND SLABS	1"	1/8"

18. LAPS AT BAR SPLICES, UNLESS NOTED OTHERWISE, SHALL BE AS FOLLOWS:

MASONRY - GRADE 60: LAP 50 DIA. (30" MIN.)
GRADE 40: LAP 48 DIA. (24" MIN.)

CONCRETE - LAP PER SCHEDULE BELOW

BAR SPLICE LAP LENGTH IN CONCRETE

BAR SIZE	f'c = 2000 PSI	f'c = 3000 PSI	f'c = 4000 PSI	f'c = 5000 PSI
#3	22	22	22	22
#4	29	29	29	29
#5	40	36	36	36
#6	57	46	43	43
#7	77	63	54	54
#8	100	82	71	71
#9	128	104	90	90
#10	162	132	115	115
#11	200	163	141	141

FOR WELDED WIRE FABRIC: SPACING OF WIRE PLUS 12".

STRAIGHT SHAFT PIERS

1. CONCRETE PIERS SHALL BE PER SCHEDULE OR DETAIL. THE ACTUAL ELEVATION SHALL BE DETERMINED IN THE FIELD BY A GEOTECHNICAL ENGINEER LICENSED IN THE STATE OF TEXAS WITH EXPERIENCE IN THIS AREA.
2. ALL REINFORCING BARS SHALL BE NEW BILLET STEEL AND SHALL CONFORM TO ASTM A-615, GRADE 60.
3. ALL REINFORCING STEEL SHALL BE CONTINUOUS WITH SPLICES LAPPED 75 BAR DIAMETERS.
4. CENTER FOOTING UNDER COLUMN OR WALL UNLESS DIMENSIONED OTHERWISE.
5. PIER SHAFT SHALL BE DRILLED PLUMB ALONG ITS TOTAL LENGTH (1" PER 10'-0" MAXIMUM TOLERANCE)
6. BOTTOM OF PIER TO BE CLEAN AND FREE OF ALL LOOSE MATERIALS AND WATER.
7. CENTER STEEL CAGE IN SHAFT WITH A MINIMUM 3 LEVELS OF CONCRETE BLOCK SPACERS (8 FT. MAXIMUM SPACING), AT BOTTOM WITH A MINIMUM OF 3" CONCRETE SEAT BLOCKS.
8. DO NOT RAISE CAGE OFF OF PIER BOTTOM DURING CONCRETE PLACEMENT.
9. CONCRETE AND REINFORCING IN SHAFTS SHALL BE PLACED THE SAME DAY AS DRILLING.
10. PIERS SHALL BE FOUNDED IN UNDISTURBED NATURAL SOIL.
11. CONTRACTOR SHALL COORDINATE WITH GEOTECHNICAL ENGINEER FOR VERIFICATION OF PIERS BEARING STRATUM AT TIME OF DRILLING.
12. WIDEN AND DEEPEN GRADE BEAMS ALL AROUND PIER LOCATIONS TO ASSURE CONCRETE COVERAGE.
13. PROVIDE INSPECTING ENGINEER WiTH AN ELECTRIC LIGHT AND PLUMB-BOB TO OBSERVE ALL DRILLED PIERS.
14. ALL DRILLED PIERS SHALL BE FREE OF WATER PRIOR TO PLACING OF CONCRETE.
15. PIER HOLES SHALL NOT BE LEFT OPEN OVERNIGHT (NO EXCEPTIONS).
16. PROVIDE STEEL CASING AS REQUIRED TO PREVENT CAVE-IN AND TO SEAL OFF SUBSURFACE WATER.
17. STEEL CASING SHALL BE REMOVED DURING CONCRETE PLACEMENT SEQUENCE.
18. CONTRACTOR SHALL INCLUDE IN BID DOCUMENTS THE COSTS FOR CASING (TO BE DETERMINED ON JOB SITE BY GEOTECHNICAL ENGINEER) AND UNIT COSTS FOR GREATER AND LESSER DEPTH OF DRILLING.
19. REFER TO GEOTECHNICAL INVESTIGATION REPORT FOR CONCRETE PLACEMENT FOR THE PIER.
20. SEE GEOTECHNICAL INVESTIGATION REPORT FOR ADDITIONAL INFORMATION.

STRUCTURAL STEEL

1. MATERIAL AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS.
2. STRUCTURAL STEEL SHALL COMPLY WITH THE FOLLOWING ASTM DESIGNATIONS:

MATERIAL	DESIGNATION	STRENGTH
ANCHOR BOLTS	A36	Fy=36 ksi
PLATES	A572	Fy=50 ksi
ANGLES	A36	Fy=36 ksi
CHANNELS	A36	Fy=36 ksi
WIDE FLANGE SHAPES	A572	Fy=50 ksi
SQUARE & RECT. STEEL TUBES (HSS)	A1085	Fy=50 ksi
ROUND TUBES (HSS)	A1085	Fy=50 ksi

3. ALL STRUCTURAL STEEL SHALL BE FABRICATED, ERECTED, AND PAINTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS AS AMENDED TO DATE AND THE CODE OF STANDARD PRACTICE, LATEST EDITION AS ADOPTED BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, AMENDED AS FOLLOWS:
   - SECTION 4.2.1, DELETE FIRST TWO SENTENCES.
   - SECTION 7., ALL REFERENCE TO OWNER SHALL BE CHANGED TO GENERAL CONTRACTOR.
   - SECTION 7.9.3, THE CONTRACTOR SHALL PROVIDE THE SEQUENCE AND SCHEDULE OF PLACEMENT OF NON-SELF SUPPORTING STEEL FRAMES.
   - SECTION 7.9.4, THE CONTRACTOR TO DESIGN SHORES, JACKS OR LOADS.
4. WELDING SHALL BE DONE IN ACCORDANCE WITH THE STANDARD CODE FOR ARC AND GAS WELDING IN BUILDING CONSTRUCTION AS PUBLISHED BY THE AMERICAN WELDING SOCIETY, EXCEPT THAT ALL WELDING SHALL BE DONE BY THE ELECTRIC ARC PROCESS. ALL WELDING SHALL BE PERFORMED BY CERTIFIED WELDERS AND SHALL CONFORM TO ANSI/AWS D1.1-04
5. DETAILED AND OR SCHEDULED CONNECTIONS HAVE NOT BEEN DESIGNED BY STRUCTURAL ENGINEER. ANY CONNECTION NOT DETAILED OR SCHEDULED OR ALTERED FOR FABRICATION PURPOSES SHALL BE SIZED AND DETAILED BY FABRICATOR AND SHALL BE MARKED FOR ENGINEER'S VERIFICATION. FABRICATOR SIZED AND DETAILED CONNECTIONS SHALL SUPPORT 55% OF THE TOTAL UNIFORM LOAD CAPACITY SHOWN IN THE TABLES OF UNIFORM CONSTANTS, PART 2 OF THE AISC MANUAL OF STEEL CONSTRUCTION FOR THE GIVEN BEAM, SPAN AND GRADE OF STEEL SPECIFIED. THE EFFECT OF ANY CONCENTRATION LOADS MUST BE TAKEN INTO ACCOUNT.
6. SEE ARCHITECTURAL PLANS FOR MISCELLANEOUS STEEL ITEMS NOT INDICATED ON STRUCTURAL DRAWINGS. STEEL ITEMS SHOWN ON ARCHITECTURAL DRAWINGS AND NOT SPECIFIED ON THE STRUCTURAL DRAWINGS SHALL BE DESIGN BY THE STEEL FABRICATOR. SEE DESIGN CRITERIA FOR LOADING.
7. ALL WELDED CONNECTIONS SHALL BE MADE USING 1/4" FILLET WELD, U.N.O.
8. ALL BOLTED CONNECTIONS SHALL BE MADE USING 3/4" DIAMETER HIGH STRENGTH BOLTS, ASTM A325, BEARING TYPE CONNECTION w/ WASHERS ASTM F436, U.N.O. ON DESIGN DRAWINGS. SPECIAL INSPECTION REQUIRED FOR ALL HIGH STRENGTH BOLTING. ALL NUTS SHALL BE PER ASTM A563
9. ALL CONNECTION PLATES AND STIFFENERS SHALL BE MADE WITH 1/4" THICK PLATES, UNLESS OTHERWISE NOTED ON PLANS.
10. ALL STEEL (INCLUDING BOLTS) EXPOSED TO THE WEATHER SHALL BE HOT DIPPED GALVANIZED. (INCLUDES STEEL THAT IS ONLY COVERED WITH PLASTER OR STUCCO). SEE ARCHITECTURAL PLANS IF STRICTER REQUIREMENTS ARE REQUIRED.
11. ALL EXPOSED STEEL SHALL FOLLOW SECTION 10 OF THE CODE OF STANDARD PRACTICE OF AISC. SECTION 10 OF THE CODE ADDRESSES ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)
12. CONNECTIONS SHALL BE PER HOLLOW STRUCTURAL SECTIONS, CONNECTION MANUAL BY AISC
13. WHERE STEEL MEMBER PASS THROUGH CMU WALLS, PROVIDE HALF INCH GAP BETWEEN THE CMU AND THE STEEL MEMBER. PROVIDE ELASTOMERIC MATERIAL BETWEEN THE THE STEEL MEMBER AND CMU WALL.
14. ALL BEAMS NOT SHOWN SHALL BE W18x55. ALL COLUMNS NOT SHOWN SHALL BE HSS8x8x1/2.
15. STEEL SHOP SHALL BE AISC CERTIFIED.
16. HOLES FOR BOLTS IN STRUCTURAL STEEL SHALL BE DRILLED OR PUNCHED. BURNING OF HOLES SHALL NOT BE PERMITTED. UNLESS NOTED OTHERWISE, HOLES SHALL BE STANDARD SIZE 1/16 INCH LARGER THAN THE BOLT.
17. ALL STRUCTURAL STEEL SHAPES SHALL BE PRIMED WITH A RUST RESISTANT PRIMER BEFORE SHIPMENT TO THE PROJECT SITE. PRIMER SHALL NOT BE APPLIED TO THE IMMEDIATE AREA OF STEEL INTENDED TO RECEIVE SLIP CRITICAL BOLTED CONNECTIONS
18. HIGH STRENGTH BOLTS INSTALLATION SHALL BE CONTINUOUSLY INSPECTED BY A SPECIAL INSPECTOR. FOLLOWING ARE REQUIREMENTS OF THE SPECIAL INSPECTOR:
   - A. HE SHALL VERIFY THE MILL CERTIFICATES FOR MATERIAL.
   - B. HE SHALL VERIFY THAT THE MATERIAL USED ARE PROPERLY STORED AND PREPARED FOR USE.
   - C. HE SHALL VERIFY THAT CONSTRUCTION DETAILS, PROCEDURES, TOOL CALIBRATIONS WORKMANSHIP ARE IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND AND BUILDING CODE.
   - D. FOR SNUG-TIGHT CONNECTIONS, HE SHALL VERIFY THAT THE PLIES OF THE CONNECTED ELEMENTS HAVE BEEN BROUGHT INTO SNUG CONTACT WITH EACH OTHER.
   - E. FOR SLIP-TIGHT CONNECTIONS, HE SHALL VERIFY THE PRETENSION METHOD SELECTED BY THE CONTRACTOR HAS INDUCED THE REQUIRED MINIMUM TENSION IN THE BOLT.
   - F. A CERTIFICATE OF INSPECTION SHALL BE FURNISHED BY THE SPECIAL INSPECTOR TO THE BUILDING OFFICIAL PRIOR TO HIS INSPECTION AND TO THE ARCHITECT AND ENGINEER.
19. WELDING IN THE FIELD SHALL BE CONTINUOUSLY INSPECTED, BY A SPECIAL INSPECTOR FOLLOWING ARE REQUIREMENTS OF THE SPECIAL INSPECTOR:
   - A. HE SHALL VERIFY THAT THE MATERIAL USED ARE PROPERLY STORED AND PREPARED FOR USE.
   - B. HE SHALL VERIFY THE WELDER'S QUALIFICATIONS.
   - C. HE SHALL VERIFY THAT CONSTRUCTION DETAILS, PROCEDURES AND WORKMANSHIP ARE IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND BUILDING CODE.
   - D. A CERTIFICATE OF INSPECTION SHALL BE FURNISHED BY THE SPECIAL INSPECTOR TO THE BUILDING OFFICIAL PRIOR TO HIS INSPECTION AND TO THE ARCHITECT AND ENGINEER.
20. ALL NON SHRINK GROUT FOR LEVELING OF BASE PLATES SHALL HAVE A MINIMUM 5000 PSI COMPRESSIVE STRENGTH AT 28 DAYS. GROUT SHALL COMPLY WITH CORPS OF ENGINEERS SPECIFICATION CRD-C 621.
21. AT ALL TUBES, PROVIDE 3/8" THICK END PLATE, U.N.O.

Structural steel connections shall be designed and detailed by the Contractor under the direct supervision of a Professional Engineer licensed in the State of Texas. Submit sealed calculations for all connections designed by the Contractor for our files.

Base Plates
a. Column base plates shall be leveled using shims or by double nuts on anchor bolts. The base plates shall be grouted with a non-shrink, high strength nonmetallic grout. The tightening of anchor bolts shall be done after supported members have been positioned and plumbed.
b. Hole sizes in base plates shall be oversized per AISC section J3.2 OR J9.
c. Anchor rods shall be:
i. Typical: ASTM F1554 Gr. 55.
ii. High Strength: ASTM F1554, Gr. 55, Weldable.

ALLOWANCE

1. IN ADDITION TO THE MATERIAL SHOWN, THE CONTRACTOR TO PROVIDE ADDITIONAL MATERIAL, FOR USE ON THE PROJECT AS DIRECTED BY THE STRUCTURAL ENGINEER FIELD REPRESENTATIVE. THE ALLOWANCE COST SHALL INCLUDE MATERIAL COST, LABOR COSTS AND PLACEMENT AT THE SITE.
2. REMAINING BALANCE AT THE END OF THE PROJECT SHALL BE RETURNED/CREDITED BACK TO THE OWNER.
3. THE ALLOWANCE SHALL APPEAR ON THE SCHEDULE OF VALUE AS A LINE ITEM.

MATERIAL	ALLOWANCE
CONCRETE	20 CU. YD.
REINFORCING STEEL	12000 LBS
STRUCTURAL STEEL	20000 LBS
CMU	2000 SQ. FT.

SPECIAL NOTES TO OWNER

1. UNDER NORMAL CONDITIONS, AND FOR CONVENTIONAL BUILDINGS SUCH AS THE SUBJECT MATTER, REINFORCED CONCRETE AND MASONRY DEVELOP CRACKS. THE CRACKS ARE DUE TO INHERENT SHRINKAGE OF CONCRETE, CREEP AND RESTRAINING EFFECTS OF VERTICAL AND OTHER STRUCTURAL ELEMENTS TO WHICH THE BEAMS/SLABS ARE TIED.
2. THE CRACKS FORMED ARE NORMALLY COSMETIC. THE SLAB MAINTAINS ITS Serviceability AND STRENGTH REQUIREMENTS. IT IS EMPHASIZED THAT ALTHOUGH SPECIAL EFFORT IS MADE TO REDUCE THE POTENTIAL CAUSES AND NUMBER OF SUCH CRACKS, IT IS NOT PRACTICAL TO PROVIDE TOTAL ARTICULATION BETWEEN THE FLOOR SYSTEM AND ITS SUPPORTS AND THEREBY ACHIEVE COMPLETE INHIBITION OF ALL CRACKS.
3. MOST SUCH CRACKS DEVELOP OVER THE FIRST THREE YEARS OF THE LIFE OF THE FLOOR SYSTEM. CRACKS WHICH ARE WIDER THAN 0.01 INCH MAY NEED TO BE PRESSURE EPOXIED. REFER TO THE NOTES UNDER "ALLOWANCES".
4. THE OBJECT OF THE JOINTS PROVIDED IS TO ALLOW MOVEMENT. MOVEMENTS DUE TO CREEP AND SHRINKAGE MAY BE NOTICEABLE AT JOINTS UP TO TWO YEARS AFTER CONSTRUCTION, BEYOND WHICH MOVEMENTS DUE TO VARIATIONS IN TEMPERATURE WILL PERSIST.

CAST-IN-PLACE CONCRETE

1. VERIFY ALL DIMENSIONS. COORDINATE WITH ARCHITECTURAL PLANS PRIOR TO CONSTRUCTION AND NOTIFY ARCHITECT AND/OR ENGINEER OF ANY DISCREPANCIES.
2. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE AMERICAN CONCRETE INSTITUTE SPECIFICATIONS, ACI #301-05, OR LATEST EDITION. DRILLED PIERS SHALL COMPLY WITH ACI 336.1-01 AND ACI 336.3R-05
3. ALL DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS, ACCESSORIES UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH THE ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE", ACI #315 LATEST EDITION
4. THE MINIMUM 28 DAYS CYLINDER STRENGTH SHALL BE AS FOLLOWS:

LOCATION	STRENGTH AT 28 DAYS	MAXIMUM SLUMP	SIZE OF LARGE AGGREGATE	WATER/CEMENT RATIO
FOUNDATIONS	3000 PSI	5"	1 1/2"	0.55
SLAB ON GRADE	3000 PSI	5"	1 1/2"	0.55
GRADE BEAMS	3000 PSI	5"	1 1/2"	0.55
WALL	3000 PSI	6"	3/4"	0.55

5. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED IN SLABS OR BEAMS.
6. VERTICAL CONSTRUCTION JOINTS IN SLABS ARE TO BE AS SHOWN ON PLANS OR AS APPROVED BY ENGINEER.
7. ALL OPENINGS IN SLAB (FOR PIPING, DRAINS, ETC.) SHALL BE SEALED WITH 1/2 SEALANT '2A' (SELF-LEVELING 2-PART POLYURETHANE).
8. UTILITIES THAT PROJECT THROUGH SLAB FLOORS SHOULD BE DESIGNED WITH EITHER SOME DEGREE OF FLEXIBILITY OR WITH SLEEVES IN ORDER TO PREVENT DAMAGE TO THESE LINE SHOULD VERTICAL MOVEMENT OCCUR.
9. BACKFILL AROUND PERIMETER TO PROVIDE POSITIVE DRAINAGE AWAY FROM SLAB.
10. FLOOR TOLERANCES
    F-NUMBER SYSTEM

	COMPOSITE	MINIMUM LOCAL VALUE
FLATNESS (F_F)	30	23
LEVELNESS (F_L)	25	19

IN ALL INSTANCES MINIMUM SLAB THICKNESS SHALL BE OBTAINED. COORDINATE SLAB FINISHES WITH ARCHITECTURAL PLANS.

11. ANCHOR BOLTS, DOWELS, INSERTS, ETC. SHALL BE SECURELY TIED IN PLACE PRIOR TO PLACING CONCRETE.
12. REFER TO ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR ALL MOLDS. GROOVES, REGLETS, ORNAMENTAL CLIPS, PIPES, CONDUITS, INSERTS, ETC. TO BE CAST IN CONCRETE. PROVIDE OVERSIZED SLEEVES FOR PLUMBING AND ELECTRICAL CONDUITS AND PIPES. NO PIPES OR DUCTS SHALL BE PLACED IN CONCRETE, FOOTINGS, OR SLAB UNLESS SPECIFICALLY DETAILED IN THESE PLANS, OR AS DIRECTED BY THE ENGINEER.
13. MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED.
14. CONCRETE TESTING SHALL BE ONE SET OF CYLINDERS FOR EVERY 50 CUBIC YARDS OR PORTION THEREOF FOR EACH TYPE OF CONCRETE POURED ON ANY GIVEN DAY. ONE SET CONSISTS OF 2 CYLINDERS TESTED FOR COMPRESSION AT 7 DAYS AND 2 CYLINDERS AT 28 DAYS.
15. VAPOR RETARDANT
    - A. VAPOR RETARDANT (UNDER SLAB): SHALL CONFORM TO ASTM E1745, CLASS A OR BETTER AND SHALL HAVE A MINIMUM WATER VAPOR PERMEANCE OF 0.01 PERMS WHEN TESTED IN ACCORDANCE WITH ASTM E96. VAPOR RETARDANT SHALL BE NOT LESS THAN 15 MILS THICK.
    - APPROVED PRODUCTS
    - A. STEGO WRAP BY STEGO INDUSTRIES LLC. (887) 464-7834.
    - B. GRIFFOLYN T-65 BY REEF INDUSTRIES (800) 231-6074.
    - C. RUFCO D16WB BY RAVEN IND. AT TEXAS ENVIRONMENTAL PLASTIC: (281) 821-7320.
    - INSTALLATION
    - A. LAY SHEETS SMOOTHLY, STRETCH AND WEIGHT EDGES, LAP JOINTS TWELVE (12) INCHES AND SEAL WITH TAPE AS SPECIFIED BY VAPOR RETARDANT MANUFACTURER. TURN BARRIER UP SIX 6 INCHES AT WALLS AND AT ALL PIPES, ABUTMENTS, ETC. TAPE AND SEAL AT PENETRATIONS AND AT EDGES.
    - B. AT GRADE BEAMS, EXTEND VAPOR RETARDANT DOWN SIDES OF BEAM TRENCHES (AND FOOTING EXCAVATIONS) TO WITHIN 4" OF TRENCH BOTTOM AND SECURE TO SIDES OF TRENCH. DO NOT EXTEND RETARDANT ACROSS BOTTOM OF BEAM TRENCH.
    - PATCHING:
    - A. PATCH ALL PUNCTURES WITH A MINIMUM OVERLAP OF 6" IN ALL DIRECTIONS AND TAPE AROUND ENTIRE PERIMETER OF REPAIR.
16. ALL CONDUIT OR PLUMBING LINES IN SLAB SHALL BE PLACED BELOW SLAB REINFORCING. ALL CONDUITS OR PLUMBING LINES SHALL NOT BE GREATER THAN 1 INCH DIAMETER AND SHALL BE PLACED NEAR THE CENTER OF THE SLAB AS MUCH AS POSSIBLE.

A. PRE-INSTALLATION CONFERENCE:
1. AT LEAST 30 DAYS PRIOR TO THE START OF THE CONCRETE SLAB CONSTRUCTION SCHEDULE, THE CONTRACTOR SHALL CONDUCT A MEETING TO REVIEW THE PROPOSED MIX DESIGNS AND TO DISCUSS THE REQUIRED METHODS AND PROCEDURES TO ACHIEVE THE REQUIRED CONCRETE CONSTRUCTION. THE CONTRACTOR SHALL SEND A PRE-CONCRETE CONFERENCE AGENDA TO ALL ATTENDEES 20 DAYS PRIOR TO THE SCHEDULED DATE OF THE CONFERENCE.
2. THE CONTRACTOR SHALL REQUIRE RESPONSIBLE REPRESENTATIVES OF EVERY PARTY CONCERNED WITH THE CONCRETE WORK TO ATTEND THE CONFERENCE, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
   - A) CONTRACTOR'S SUPERINTENDENT
   - B) LABORATORY RESPONSIBLE FOR CONCRETE MIXES AND/ OR FIELD QUALITY CONTROL
   - C) READY-MIX CONCRETE PRODUCER
   - D) CONCRETE SUBCONTRACTOR
   - E) ADMIXTURE MANUFACTURER(S)
   - F) LIQUID DENSIFIER AND SEALER MANUFACTURER
   - G) LIQUID DENSIFIER AND SEALER APPLICATION
   - H) JOINT FILLING APPLICATOR
3. MINUTES OF THE MEETING SHALL BE RECORDED, TYPED AND PRINTED BY THE CONTRACTOR AND DISTRIBUTED BY HIM TO ALL CONCERNED PARTIES, INCLUDING THE OWNER'S REPRESENTATIVE, THE ARCHITECT, AND THE STRUCTURAL ENGINEER WITHIN FIVE DAYS OF THE MEETING.

B. **CONCRETE SUBCONTRACTOR QUALIFICATION:**
1. THE CONCRETE SUBCONTRACTOR SHALL INCLUDE IN THEIR BID PACKAGE TO THE CONTRACTOR, SUFFICIENT DATA THAT CLEARLY INDICATES THE CONCRETE CONTRACTOR'S ABILITY TO SUCCESSFULLY PERFORM THE WORK AND TO ACHIEVE THE FLOOR SLAB TOLERANCES SPECIFIED IN THIS SECTION. THE CONCRETE SUBCONTRACTOR'S TEAM SHALL HAVE PARTICIPATED IN THE MAJORITY OF THESE PROJECTS, AND THAT TEAM SHALL REMAIN THE SAME THROUGH THE DURATION OF THIS PROJECT.

C. **CONCRETE MATERIAL:**
1. PORTLAND CEMENT: ASTM C 150, TYPE I. USE ONE BRAND OF CEMENT THROUGHOUT THE PROJECT.
2. COARSE AND FINE AGGREGATES: ASTM C33. COMBINED AGGREGATE GRADATION FOR SLABS ON GRADE AND OTHER DESIGNATED CONCRETE SHALL BE 8% - 18% FOR LARGE TOP AGGREGATES (1 1/2") OR 8% - 22% FOR SMALLER TOP SIZE AGGREGATES (1" OR 3/4") RETAINED ON EACH SIEVE BELOW THE TOP SIZE AND ABOVE THE NO. 100 SIEVE. SLABS ON GRADE SHALL HAVE A MAXIMUM AGGREGATE SIZE OF 1-1/2" FOOTINGS AND PIERS 1" AND BEAMS 3/4".
3. WATER: COMPLYING WITH ASTM C 94.
4. ALL CONCRETE SHALL CONTAIN "POZZOLITH" ADMIX AS PER MANUFACTURER'S SPECIFICATIONS, IN ACCORDANCE WITH ASTM C494.

D. **ADMIXTURES:**
1. AIR-ENTRAINING ADMIXTURES: SHALL CONFORM TO ASTM C-260. ADMIXTURE MANUFACTURER SHALL PROVIDE WRITTEN CERTIFICATION THAT THE AIR-ENTRAINING ADMIXTURE IS COMPATIBLE WITH OTHER REQUIRED ADMIXTURES. ALL EXTERIOR SLABS SHALL BE AIR-ENTRAINED (4% - 6%). ACCEPTABLE PRODUCTS: EUCLID CHEMICAL AEA-92 AND AIRMIX 200, MASTER BUILDERS MICROAIR, W.R. GRACE DARAVAIR 1000 AND DAREX-11.
   NOTE: AIR-ENTRAINING ADMIXTURE SHALL NOT BE USED ON INTERIOR CONCRETE.
2. WATER-REDUCING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE A AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL WR-89 AND WR-91, MASTER BUILDERS 200N AND 322N, W.R. GRACE WRDA 36 AND WRDA 64.
3. WATER REDUCING, RETARDING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE D, AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL RETARDER 75, MASTER BUILDERS POZZOLITH R, W.R. GRACE DARATARD 17.
4. HIGH RANGE WATER-REDUCING ADMIXTURE (SUPERPLASTICIZER): SHALL CONFORM TO ASTM C494, TYPE F OR TYPE G AND CONTAIN NOT MORE THAN 0.05% CHLORIDE IONS. ACCEPTABLE PRODUCTS : EUCLID CHEMICAL EUCON 37, MASTER BUILDERS REOBUILD 1000 W.R. GRACE DARACEM - 1000.
5. WATER-REDUCING, NON-CORROSIVE ACCELERATING ADMIXTURE: SHALL CONFORM TO ASTM C494, TYPE C OR E, AND CONTAIN NOT MORE CHLORIDE IONS THAN ARE PRESENT IN MUNICIPAL DRINKING WATER. THE ADMIXTURE MANUFACTURER MUST HAVE LONG-TERM, NON-CORROSIVE TEST DATA FROM AN INDEPENDENT TESTING LABORATORY (OF AT LEAST A YEAR'S DURATION) USING AN ACCEPTABLE ACCELERATED CORROSION TEST METHOD SUCH AS THAT USING ELECTRICAL POTENTIAL MEASURES. ACCEPTABLE PRODUCTS: EUCLID CHEMICAL ACCELGUARD 80/90 AND ACCELGUARD NCA, MASTER BUILDERS NC534 AND POZZUTEC 20, W.R. GRACE POLARSET.
6. PROHIBITED ADMIXTURES:
   - a.) CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 0.05% CHLORIDE IONS ARE NOT PERMITTED.
   - b.) FLYASH; A MAXIMUM OF 20% AS CEMENT REPLACEMENT ALLOWED

E. **EVAPORATION RETARDER:**
1. WATERBORNE, MONOMOLECULAR FILM FORMING, MANUFACTURED FOR APPLICATION TO FRESH CONCRETE.
   - a.) ACCEPTABLE PRODUCTS:
     "EUCOBAR" BY THE EUCLID CHEMICAL COMPANY - CONTACT: PHIL BRANDT (877) 438-3826

F. CURING MATERIALS:
1. EXTERIOR CURING: ALL EXTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE-FORMING CURING COMPOUND. THE LIQUID MEMBRANE-FORMING CURING COMPOUND SHALL MEET THE REQUIREMENTS OF ASTM C 1315 WITH A MAXIMUM V.O.C. CONTENT OF 700 G/L.
   - a.) ACCEPTABLE PRODUCTS:
     "SUPER REZ SEAL" BY EUCLID CHEMICAL COMPANY - CONTACT PHIL BRANDT (877) 438-3826
2. INTERIOR CURING: ALL INTERIOR CONCRETE SLABS SHALL BE CURED USING A REDUCED ODOR, DISSIPATING LIQUID MEMBRANE FORMING CURING COMPOUND THAT IS FORMULATED FROM HYDROCARBON RESINS. THE DISSIPATING LIQUID MEMBRANE FORMING CURING COMPOUND SHALL MEET THE REQUIREMENTS OF ASTM C-309 AND V.O.C. CONTENTS IN ACCORDANCE TO EPA 40 CFR, PART 59, TABLE I, SUBPART D FOR CONCRETE CURING COMPOUNDS WITH A MAXIMUM V.O.C. CONTENT OF 350 G/L. APPLY AT 400 S.F./GALLON.
   - a.) ACCEPTABLE PRODUCTS:
     "KUREZ DR VOX" BY THE EUCLID CHEMICAL COMPANY - CONTACT PHIL BRANDT (877) 438-3826
   ALL CONCRETE SLABS SHALL ALSO BE MAINTAINED MOIST FOR 7 DAYS

G. **CONCRETE MIXES**
1. COMPLY WITH ACI 301 REQUIREMENTS FOR CONCRETE MIXTURE, U.N.O..
2. PREPARE DESIGN MIXES SIGNED AND SEALED BY A PROFESSIONAL ENGINEER, PROPORTIONED ACCORDING TO ACI 301, FOR NORMAL WEIGHT CONCRETE DETERMINED BY EITHER LABORATORY TRIAL MIX OR FIELD TEST DATA AS FOLLOWS:
   CONCRETE MATERIALS INCLUDED IN THE MIX DESIGN SHALL BE THE SAME MATERIALS PROVIDED TO THE PROJECT, AND SHALL BE PREPARED BY AN INDEPENDENT TESTING LABORATORY APPROVED BY THE OWNER. THE LABORATORY MIX DESIGN SHALL NOT EXCEED THE DESIRED JOB STRENGTH OF CONCRETE BY 1,200 PSI. FOUR COPIES OF THE MIX DESIGN SHALL BE SUBMITTED TO THE OWNER BEFORE CONCRETE WORK BEGINS.
3. SLUMP: CONCRETE CONTAINING HRWR SHALL HAVE A MAXIMUM SLUMP OF 8" (200MM). ALL OTHER CONCRETE SHALL NOT EXCEED 4 INCHES (100 MM) UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
4. ADJUSTMENT TO CONCRETE MIXES: MIX DESIGN ADJUSTMENTS MAY BE REQUESTED BY CONTRACTOR WHEN CHARACTERISTICS OF MATERIALS, JOB CONDITIONS, WEATHER, TEST RESULTS OR OTHER CIRCUMSTANCES WARRANT, AT NO ADDITIONAL COST TO OWNER AND AS ACCEPTED BY OWNER. LABORATORY TEST DATA FOR REVISED MIX DESIGN AND STRENGTH RESULTS MUST BE SUBMITTED TO AND ACCEPTED BY OWNER BEFORE USING IN WORK. BOTH THE CONCRETE TESTING AND INSPECTION AGENCY AND THE CONCRETE CONTRACTOR SHALL SATISFY THEMSELVES THAT THE CONCRETE MIX DESIGN WILL PRODUCE A CONCRETE WHICH WILL MEET THE SPECIFICATIONS FOR THIS PROJECT. IN ADDITION, THE CONTRACTOR AND CONCRETE FINISHER SHALL VERIFY THAT THE WORKABILITY, FINISHABILITY AND SETTING TIMES ARE APPROPRIATE FOR SLAB INSTALLATIONS. PLACEMENT SHALL BE MADE BY CHUTE DIRECTLY FROM THE CONCRETE TRUCKS. IF PUMPING OF THE CONCRETE IS CONTEMPLATED FOR ANY SPECIAL LOCATIONS, THE PROPORTIONS ESTABLISHED ABOVE SHALL NOT BE ALTERED TO SUIT THE CAPABILITIES OF THE PUMPING EQUIPMENT.
5. READY MIX CONCRETE SHALL COMPLY WITH REQUIREMENTS OF ASTM C94. WHEN AIR TEMPERATURE IS BETWEEN 85° AND 90° F, REDUCE MIXING AND DELIVERY TIME FROM 90 MINUTES TO 75 MINUTES; WHEN AIR TEMPERATURE IS ABOVE 90° F, REDUCE MIXING AND DELIVERY TIME TO 6O MINUTES.
6. WATER CEMENT RATIO SHALL BE BASED ON SURFACE DRY MATERIAL.

H. CONTRACTION JOINTS IN SLABS-ON-GRADE:
FORM WEAKENED-PLANE CONTRACTION JOINTS, SECTIONING CONCRETE INTO AREAS AS INDICATED. CONSTRUCT CONTRACTION JOINTS FOR A DEPTH EQUAL TO AT LEAST ONE-FOURTH OF THE CONCRETE THICKNESS, AS FOLLOWS:
SAWED JOINTS: ALL SAW CUTTING SHALL BE ACCOMPLISHED WITH A SOFT-CUT SAW AS SOON AS THE SLAB WILL SUPPORT THE WEIGHT OF THE SAW AND OPERATOR. NOTE: CONCRETE DUST SHALL BE REMOVED COMPLETELY AND IMMEDIATELY. IF CHALK LINES ARE USED FOR SAW CUTS, ALL CHALK REMAINING ON SLAB SHALL BE REMOVED COMPLETELY AND IMMEDIATELY AFTER SAWING.

I. **FLOOR SLAB TOLERANCES:**
COMPLY WITH ACI 117, "SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS." ALL INTERIOR FLOOR SLABS SHALL MEET THE REQUIREMENTS OF A TYPE 5, SINGLE COURSE, HARD STEEL - TROWELED FINISH AS DESCRIBED IN ACI 302.IR- LATEST EDITION.

J. CONCRETE CURING AND PROTECTION:
a) FIRST, ALL EXTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE- FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS AS SOON AS POSSIBLE AFTER FINAL FINISHING. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F. BEGIN CURING AFTER FINISHING CONCRETE, BUT NOT BEFORE FREE WATER HAS DISAPPEARED FROM CONCRETE SURFACE. CURING COMPOUND SHALL BE PLACED WITHIN FOUR (4) HOURS AFTER CONCRETE HAS BEEN PLACED.

b) SECOND, CONCRETE SHALL BE MAINTAINED ABOVE 50 DEGREES F AND IN A MOIST CONDITION FOR AT LEAST THE FIRST SEVEN (7) DAYS AFTER PLACEMENT.

1. a)TEFIRST, ALL INTERIOR CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE-FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS AS SOON AS POSSIBLE AFTER FINAL FINISHING. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F. BEGIN CURING AFTER FINISHING CONCRETE, BUT NOT BEFORE FREE WATER HAS DISAPPEARED FROM CONCRETE SURFACE. CURING COMPOUND SHALL BE PLACED WITHIN FOUR (4) HOURS AFTER CONCRETE HAS BEEN PLACED.

b) SECOND, CONCRETE SHALL BE MAINTAINED ABOVE 50 DEGREES F AND PONDED WITH WATER FOR SEVEN (7) DAYS AFTER CONCRETE PLACEMENT.

c) THIRD, CONCRETE SLABS SHALL BE CURED USING A LIQUID MEMBRANE- FORMING CURING COMPOUND TO BE APPLIED EVENLY AND UNIFORMLY PER MANUFACTURER'S INSTRUCTIONS. SURFACE SHALL BE DAMP, BUT NOT WET AND CAN NO LONGER BE MARRED BY A WALKING WORKMAN. ALL APPLICATIONS SHALL BE MADE BY AN APPLICATOR CERTIFIED BY THE MANUFACTURER, AND WHEN SURFACE AND AIR TEMPERATURE IS ABOVE 50° F.

2. INTERIOR SLAB PROTECTION:
   TAKE THE FOLLOWING MEASURES TO PROTECT FLOOR SLAB:
   - A. WRAP OR "DIAPER" ALL MOTORIZED AND HYDRAULIC EQUIPMENT TO PREVENT FLUID LEAKS.
   - B. PROVIDE NON-MARKING TIRES ON RUBBER TIRED VEHICLES OR EQUIP RUBBER TIRES WITH TIRE BOOTS MADE OF NYLON FABRIC.
   - C. SOURCE FOR DIAPERS AND BOOTS: R&R TIRE SURFACE PROTECTORS, INC., FORT COLLINS CO 80526, (970) 266-4082
   - D. PROVIDE MATS AT ALL ENTRANCES TO PREVENT MUD STAINS.
   - E. COVER SLAB PRIOR TO PAINTING. ALL SPILLS TO BE CLEANED WITH SOAP AND WATER. LACQUER THINNER WILL NOT BE ACCEPTABLE.

ABBREVIATIONS

TYP	TYPICAL
SIM	SIMILAR
T&S	TYPICAL AND SIMILAR
U.N.O.	UNLESS NOTED OTHERWISE
CLR	CLEAR
(V)	VERTICAL
CA	COLUMN ABOVE

METAL STUDS

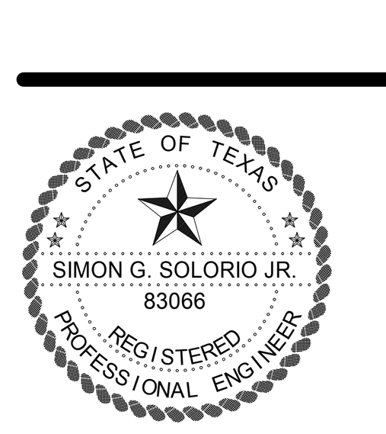
All metal studs indicated on the structural and architectural drawings indicate the maximum depth of the metal stud. The metal stud supplier shall retain a Texas Professional Engineer to design and detail the all the exterior and interior metal studs. Submit shop drawings including calculations for review

PRE STRESSED HOLLOW CORE CONCRETE SLABS

PLANK DESIGNATIONS AS SHOWN ON THE DRAWINGS ARE FOR "SPANCRETE" PRE STRESSED
HOLLOW CORE CONCRETE SLABS. THEY SHALL BE AS SUPPLIED BY GATE CONCRETE PRODUCTS
COMPANY, PEARLAND, TEXAS, OR REVIEWED EQUIVALENT, AND MANUFACTURED ACCORDING TO
2. THE FOLLOWING SPECIFICATIONS:
CONCRETE STRENGTH 5000 PSI; 8" Deep hollow core, 36" wide and 48" wide
NOMINAL END BEARING = 3"
3. PLANK HEADERS SHALL BE PROVIDED BY PLANK SUPPLIER TO SUPPORT PLANK ENDS AT
FLOOR AND ROOF OPENINGS AS REQUIRED. PLANK SUPPLIER SHALL COORDINATE SIZES,
LOCATIONS OF ALL FLOOR AND ROOF OPENINGS WITH ARCHITECTURAL PLANS.
PLANK DESIGNATIONS AS SHOWN ON THE CONTRACT DOCUMENTS ARE FOR BID PURPOSES
ONLY. DESIGN OF HOLLOW CORE CONCRETE SLABS SHALL BE FURNISHED BY THE SLAB
4. MANUFACTURER. SUCH DESIGN SHALL BEAR THE ENGINEERING REGISTRATION SEAL FOR THE
5. STATE OF TEXAS OF THE APPROVED PRODUCT ENGINEERING DESIGNER. DRAWINGS AND
DESIGN SHALL BE PROVIDED FOR ENGINEER'S APPROVAL PRIOR TO SLAB FABRICATION.
DESIGN LOADS SHALL BE AS NOTED IN THE DESIGN CRITERIA ON THESE DRAWINGS.
6. CONCRETE TOPPING SHALL BE AS NOTED BELOW. REINFORCE THE CONCRETE
TOPPING WITH NON-FERROUS OR METALIC REINFORCING TO MINIMIZE SHRINKAGE
7. PROPOSED MATERIAL SHALL HAVE A FINISH AND BOND ACCEPTABLE TO ARCHITECT.
EXTERIOR CONCRETE TOPPING SLAB CONCRETE SHALL DEVELOP A 28 DAY COMPRESSIVE
8. STRENGTH OF 5000 PSI. MAXIMUM AGGREGATE SIZE SHALL BE 3/8"
9. INTERIOR CONCRETE TOPPING SLAB CONCRETE SHALL DEVELOP A 28 DAY COMPRESSIVE
STRENGTH OF 3000 PSI. MAXIMUM AGGREGATE SIZE SHALL BE 3/8"
10. MINIMIM THICKNESS OF INTERIOR TOPPING SHALL BE 2 INCHES.
EXTERIOR TOPPING SHALL HAVE POSITIVE DRAINAGE AWAY FROM THE STRUCTURE INTO
BE MINIMUM FY = 60,000 PSI GALVANIZED
HEADERS OR BLOCKOUTS SHALL BE DESIGNED BY HOLLOW CORE SUPPLIER. STEEL SHALL
Provide 3" normal weight concrete topping with 2.4 x 2.4 W2.4 wire mesh. wire mesh shall be in sheets, rolls not allowed

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F-1616

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com



THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR., PE 83066 ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

General Notes

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S101

SPECIAL INSPECTION, MATERIALS TESTING.

1. RESPONSIBILITIES OF THE OWNER
   A. EMPLOY AND PAY THE SPECIAL INSPECTION AGENCY TO PERFORM INSPECTIONS SPECIFIED IN THIS SECTION AND THOSE REQUIRED BY AUTHORITIES HAVING JURISDICTION.
   B. EMPLOY AND PAY THE MATERIALS TESTING LABORATORY TO PERFORM TESTS SPECIFIED IN THIS SECTION AND THOSE REQUIRED BY AUTHORITIES HAVING JURISDICTION.
      1) RETESTING - THE CONTRACTOR SHALL REIMBURSE THE OWNER FOR RE-TESTING WHERE RESULTS OF INSPECTIONS AND TESTS PROVE UNSATISFACTORY AND INDICATE NONCOMPLIANCE WITH REQUIREMENTS.
   C. EMPLOY THE DESIGN PROFESSIONAL RESPONSIBLE FOR THE STRUCTURAL DESIGN OR ANOTHER ENGINEER OR ARCHITECT DESIGNATED BY THE (DPR) TO PERFORM STRUCTURAL OBSERVATION. (REF 1702)
2. DEFINITIONS
   A. APPROVED FABRICATOR: A FABRICATOR REGISTERED AND APPROVED BY THE BUILDING OFFICIAL AND ENGINEER OF RECORD, TO PERFORM WORK, OFF SITE, REQUIRING SPECIAL INSPECTION WITHOUT SPECIAL INSPECTION. THE DESCRIPTION IN SECTION 1701.1 OF THE 1998 CALIFORNIA BUILDING CODE IS APPLICABLE.
   B. SPECIAL INSPECTION AGENCY: THE ACCREDITED INSPECTION BODIES DESIGNATED HEREIN AND APPROVED BY THE ENGINEER OF RECORD TO PERFORM SPECIAL INSPECTION AS REQUIRED BY THE BUILDING CODE AND THE PROJECT SPECIFICATIONS AND AS DESCRIBED IN SECTION 1701 1998 CALIFORNIA BUILDING CODE.
   C. SPECIAL INSPECTOR: A QUALIFIED PERSON, EMPLOYED BY THE SPECIFIED SPECIAL INSPECTION AGENCY, WHO HAS DEMONSTRATED COMPETENCE TO THE SATISFACTION OF THE BUILDING OFFICIAL FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION. DUTIES INCLUDE VISUAL OBSERVATIONS AND FIELD MEASUREMENTS OF MATERIALS, OBTAINING SPECIMENS FOR TESTS AND RELATED ACTIONS INCLUDING PREPARATION OF REPORTS.
   D. TESTING LABORATORY: AN ACCREDITED MATERIALS TESTING LABORATORY, APPROVED BY THE ENGINEER OF RECORD, TO MEASURE, EXAMINE, TEST, CALIBRATE OR OTHERWISE DETERMINE THE CHARACTERISTICS OR PERFORMANCE OF CONSTRUCTION MATERIALS.
   E. CONTINUOUS INSPECTION: ON SITE INSPECTION BY THE SPECIAL INSPECTOR ON A CONTINUOUS BASIS OBSERVING ALL WORK REQUIRING SPECIAL INSPECTION.
   F. PERIODIC INSPECTION: INTERMITTENT INSPECTION AS PERMITTED BY THE PLAN SPECIFICATIONS AT PREDETERMINED INTERVALS OR MORE FREQUENTLY AS WORK PROGRESSES. NO SIGNIFICANT ELEMENTS OR AREAS SHALL BE COVERED BY ADDITIONAL WORK UNTIL APPROVED BY THE MUNICIPAL BUILDING INSPECTOR AND/OR THE SPECIAL INSPECTOR.
   G. STRUCTURAL OBSERVATION: THE VISUAL OBSERVATION, BY THE ENGINEER OF RECORD OR HIS DESIGNEE, INCLUDING BUT NOT LIMITED TO THE ELEMENTS AND CONNECTIONS, OF THE STRUCTURAL SYSTEM, FOR GENERAL CONFORMANCE TO THE APPROVED PLANS AND SPECIFICATION, AT SIGNIFICANT CONSTRUCTION STAGES AND AT COMPLETION OF THE STRUCTURAL SYSTEM. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE SPECIAL AND MUNICIPAL INSPECTIONS REQUIRED BY CODES AND SPECIFICATIONS.
   H. EOR: ENGINEER OF RECORD
   I. DPR: ENGINEER OF RECORD/DESIGN PROFESSIONAL OF RECORD
   J. SPECIAL INSPECTION AND MATERIALS TESTING
      THIS SECTION APPLIES TO THE STRUCTURAL PORTIONS OF THE PROJECT REQUIRING SPECIAL INSPECTION. THE SPECIAL INSPECTORS DUTIES ARE DESCRIBED IN CBC 1701.3 AND CBC 1701.5
      DOCUMENTED METHODS AND PROCEDURES SHALL BE USED FOR INSPECTION AND TESTING REQUIRED OF CONTRACTUAL DOCUMENTS, AND FOR ESTABLISHING ACCEPTANCE CRITERIA. ALL INSTRUCTIONS, STANDARDS, PROCEDURES, CHECKLISTS RELEVANT TO THE WORK WILL BE KEPT UP TO DATE AND READILY AVAILABLE FOR USE. NO INSPECTION OR TEST WILL BE PERFORMED IF THE SAFETY OF THE TESTING PERSONNEL IS IN QUESTION DUE TO JOB SITE CONDITIONS. PRIOR TO PROJECT COMMENCEMENT, THE TESTING AGENCY WILL CONFER WITH AND OBTAIN THE APPROVAL FROM THE APPROPRIATE DESIGN PROFESSIONAL OF RECORD REGARDING THE INSPECTION AND TESTING PROCEDURES OR SPECIFICATIONS INCLUDING ANY APPROPRIATE ASTM METHODS, CODE REQUIREMENTS OR PROJECT SPECIFICATION REQUIREMENTS. AT THE START OF AND DURING EACH INSPECTION OF THE PROJECT TO ASCERTAIN PROPOSED CONFORMITY OF MATERIALS, PERSONNEL QUALIFICATIONS, AS REQUIRED, AND PROCEDURES WITH APPLICABLE CODES, PLANS, AND SPECIFICATIONS.
      1. ALL INSPECTIONS SHALL BE PERFORMED BY AN ACCREDITED, APPROVED SPECIAL INSPECTION AGENCY EMPLOYED BY THE OWNER OR OWNER'S AGENT, NOT THE CONTRACTOR OR SUBCONTRACTOR.
         ACCREDITATION TO ASTM E-329-95C, STANDARD
         SPECIFICATIONS FOR AGENCIES ENGAGED IN THE TESTING AND/OR INSPECTION OF MATERIALS USED IN CONSTRUCTION, IS PREFERRED.
         COPIES OF THE TEST RESULTS AND FINAL REPORTS SHALL BE FURNISHED TO THE ENGINEER OF RECORD (EOR) IN ADDITION TO OTHER NORMAL DISTRIBUTIONS, WITHIN TWO DAYS OF THE TEST. IN THE CASE OF DISCREPANCIES OR DEFICIENCIES, THE SPECIAL INSPECTION AGENCY SHALL IMMEDIATELY NOTIFY THE EOR. TESTING FREQUENCY SHALL BE PER APPLICABLE STRUCTURAL MASONRY, REINFORCED CONCRETE, AND STRUCTURAL STEEL WELDING CODES AND STANDARDS AND ARE PART OF THIS SPECIFICATION.
         A. CERTIFICATE OF SATISFACTORY COMPLETION OF WORK REQUIRING SPECIAL INSPECTION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION BY THE CONTRACTOR.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE TEST AND/OR INSPECTION FIRM WITH A CONSTRUCTION SCHEDULE TO FACILITATE THE PROPER COORDINATION.
4. THE SPECIAL INSPECTOR SHALL FURNISH DAILY INSPECTION REPORTS TO THE BUILDING OFFICIAL, THE ARCHITECT, AND THE ENGINEER AT A MINIMUM PER WEEK FREQUENCY. THE SPECIAL INSPECTOR SHALL SUBMIT A FINAL REPORT, SIGNED BY BOTH HE AND HIS SUPERVISOR, STATING WHETHER THE WORK REQUIRING SPECIAL INSPECTION WAS IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE WORKMANSHIP PROVISIONS OF THE CBC.
5. ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION; THEN IF UNCORRECTED, TO THE PROPER DESIGN AUTHORITY AND THE BUILDING OFFICIAL.
6. SPECIAL INSPECTION REPORTS
   THESE REPORTS SHALL INCLUDE, AS A MINIMUM, THE FOLLOWING INFORMATION:
   A. PERMIT NUMBER
   B. NAME OF THE MUNICIPAL INSPECTOR, IF AVAILABLE, AND OF THE GOVERNING MUNICIPALITY
   C. SPECIAL INSPECTION AGENCY NAME, ADDRESS, AND PHONE NUMBER
   D. UNIQUE IDENTIFICATION OF THE REPORT AND OF EACH PAGE.
   E. CLIENT NAME AND ADDRESS
   F. NAME AND ADDRESS OF THE DESIGN PROFESSIONAL OF RECORD, AND OTHER DESIGNERS OR ENGINEERS APPLICABLE TO THE PROJECT
   G. DESCRIPTION OF THE TYPE OF INSPECTION PERFORMED
   H. ANY UNRESOLVED DEVIATIONS, EXCLUSIONS, AND ADDITIONS TO OR FROM THE APPROVED DRAWINGS AND SPECIFICATIONS RELEVANT TO THE SPECIFIC INSPECTION OR TEST.
   I. COMPLIANCE FINDINGS AND REFERENCE
   J. DESCRIPTION OF LOCATION WHERE THE INSPECTION WAS PERFORMED WITHIN THE PROJECT
   K. TIME AND DATE OF THE INSPECTION
   L. MEASUREMENTS, EXAMINATIONS, AND DERIVED RESULTS SUPPORTED BY TABLES, GRAPHS, SKETCHES, OR PHOTOGRAPHS AS APPROPRIATE
   M. THE NAME, SIGNATURE, TITLE, AND IDENTIFICATION NUMBER, AS APPROPRIATE, OF THE FIELD INSPECTOR PERFORMING THE INSPECTION
   N. IDENTIFICATION OF SUBCONTRACTORS EMPLOYED TO CARRY OUT TESTS OR PARTS OF TESTS
7. TESTS REPORTS
   LABORATORY TESTS AND MILL CERTIFICATIONS ARE REQUIRED TO BE SUBMITTED TO THE ENGINEER OF RECORD. THESE REPORTS SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:
   1. CONCRETE CYLINDERS
   2. REINFORCING STEEL
   3. STRUCTURAL STEEL
   4. CONCRETE MIXES
   5. CONCRETE ANCHORS
8. SPECIAL INSPECTION BY A SPECIAL OR DEPUTY INSPECTOR FROM AN ACCREDITED, EOR APPROVED INSPECTION AGENCY AND WITH THE APPROPRIATE CURRENT MUNICIPAL LICENSES AND CERTIFICATIONS SHALL BE REQUIRED FOR THE TYPE OF WORK LISTED BELOW.

8A CONTINUOUS INSPECTION REQUIRED FOR THE FOLLOWING:
   A. REINFORCED CONCRETE:
      1. DURING PLACEMENT OF REINFORCED CONCRETE WHERE THE STRUCTURAL DESIGN IS BASED ON F'C GREATER THAT 3,000 PSI AND THE TAKING TEST SPECIMENS. THE NUMBER OF AND FREQUENCY OF TAKING OF TEST SPECIMENS SHALL BE THE MINIMUM REQUIRED BY THE GOVERNING MUNICIPAL BUILDING CODE OR AS SPECIFIED BY THE APPROVED STRUCTURAL PLANS, WHICHEVER IS THE GREATER NUMBER.
      2. DURING THE PLACEMENT OF REINFORCING STEEL AND PRE STRESS TENDONS UNLESS THE SPECIAL INSPECTOR HAS INSPECTED FOR CONFORMANCE WITH THE APPROVED PLANS PRIOR TO THE CLOSING OF FORMS OR THE DELIVERY OF CONCRETE TO THE JOBSITE.
      3. DURING THE PLACEMENT OF REINFORCING STEEL AND CONCRETE FOR CAST-IN-PLACE DRILLED PILES OR CAISSONS.
      4. INSPECTION IS REQUIRED ON CAST-IN-PLACE PILES OR CAISSONS, EVEN IF F'C IS LESS THAN 2,500 PSI.
      5. PRIOR TO AND DURING THE PLACEMENT OF CONCRETE AROUND BOLTS WHEN STRESS INCREASES PERMITTED BY FOOTNOTE 5 OF TABLE 19E, SECTION 1925 OF THE UNIFORM BUILDING CODE FOR THE USE OF FULL VALUES FOR EMBEDDED BOLTS.
      6. PRIOR TO AND DURING THE INSTALLATION OF ANCHORS REQUIRING TO BE DRILLED INTO CONCRETE.
      7. DURING THE STRESSING AND GROUTING OF TENDONS IN PRE STRESSED
      8. CONTINUOUS INSPECTION FOR THE PLACEMENT OF THE REINFORCEMENT AND CONCRETE AT CONCRETE MOMENT FRAMES WITHIN SEISMIC ZONES 3 & 4
      9. SHOT CRETE PLACEMENT AND DURING THE TAKING OF TEST SPECIMENS. PERIODIC INSPECTION FOR REINFORCED CONCRETE SHALL BE PERFORMED WHEN SPECIFIED, AS MINIMUMS:
         1. AT THE START OF AND DURING EACH INSPECTION OF THE PROJECT TO ASCERTAIN PROPOSED CONFORMITY OF MATERIALS, PERSONNEL QUALIFICATIONS AS REQUIRED, AND PROCEDURES WITH THE APPLICABLE CODES, PLANS AND SPECIFICATIONS.
         2. REINFORCEMENT VERIFICATION PRIOR TO THE PLACEMENT OF CONCRETE
         3. DURING THE PLACEMENT OF CONCRETE
         4. DURING THE MOLDING, CONSTRUCTION OF TAKING OF COMPRESSION SAMPLES, BEAMS, CORES OR PANELS.
         5. AT SUCH FREQUENCY AS NECESSARY TO CLEARLY CONFIRM THE PLACEMENT OF TIES, HOOPS, STIRRUPS, CONNECTIONS, AND ANY ADDITIONAL SPECIFIED REINFORCEMENT (I.E. @ OPENINGS, BEAMS, CORNERS, COLUMNS, PIERS, AND CAISSONS) BEFORE THEY ARE COVERED.
         6. DURING SAMPLING OF CONCRETE AT DISCHARGE FROM MIXER.
         7. BEFORE ANY CONCRETE IS PLACED FOR VERIFICATION OF MIX DESIGN
         8. ALL FUNCTIONS AT THE BATCHING PLANT FOR READY MIX. THIS COULD INCLUDE CEMENT SAMPLING OR TEST RESULTS, GRAVEL GRADATION, CHECKING CALIBRATION OF EQUIPMENT AND ADMIXTURE APPROVALS.
   B. STRUCTURAL WELDING - GENERAL - INSPECTOR'S DUTIES
      1. ALL FIELD WELDING NOT DONE IN AN APPROVED FABRICATORS SHOP EXCEPT THAT PERIODIC INSPECTION THE FREQUENCY OF WHICH IS DETERMINED PRIOR TO THE START OF THE PROJECT SHALL BE ALLOWED PER SECTION 1701.5, #5 EXCEPTIONS.
      2. DURING ALL FIELD WELDING OF SPECIAL MOMENT-RESISTING FRAMES; IN ADDITION, NONDESTRUCTIVE TESTING AS REQUIRED BY SECTION 1703.
      3. THE SPECIAL INSPECTOR SHALL REVIEW EOR APPROVED WELDING PROCEDURES SPECIFICATIONS (WPS) WHEN OTHER THAN STANDARD AWS PRE QUALIFIED JOINTS AND PROCEDURES ARE INVOLVED.
      4. THE SPECIAL INSPECTOR SHALL REVIEW APPLICABLE SECTION OF REFERENCED CODES, PARTICULARLY THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE (AWS D1.1) AND THE MANUAL, AND SPECIFICATIONS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC).
      5. THE SPECIAL INSPECTOR SHALL REVIEW MILL TEST REPORTS AND CHECK HEAT NUMBERS WITH MATERIAL AS RECEIVED. VERIFY THAT PROPER IDENTIFICATION OF STEEL IS MAINTAINED DURING FABRICATION.
      6. THE SPECIAL INSPECTOR SHALL, WHEN REQUIRED BY PROJECT SPECIFICATIONS, MARK SAMPLE LOCATION WITH STEEL STAMP ON EACH PIECE TESTED.
      7. THE SPECIAL INSPECTOR SHALL RECORD SAMPLE NUMBER AND LOCATION AND CHECK THAT SAMPLE IDENTIFICATION IS MAINTAINED AS SAMPLES ARE DELIVERED TO LABORATORY AND TESTED.
      8. THE SPECIAL INSPECTOR SHALL WHEN STEEL MEMBERS ARE DELIVERED TO FINISH AND NO "CROP ENDS" ARE AVAILABLE FOR SAMPLE CUTTING, COORDINATE CUTTING AND PATCHING REQUIREMENTS WITH THE ARCHITECT/ENGINEER

9A. WELDING OBSERVATION - (APPLICABLE TO SHOP AND FIELD)
   1. THE SPECIAL INSPECTOR SHALL CHECK EACH WELDER'S CERTIFICATION AND VERIFY THAT THE WELDER DOES WORK ONLY AS QUALIFIED BY HIS CERTIFICATION
   2. THE SPECIAL INSPECTOR SHALL KEEP A WRITTEN RECORD OF EACH WELDER BY NAME, IDENTIFICATION NUMBER AND HIS IDENTIFYING STEEL MARK, IF APPLICABLE, AND THE PERCENTAGE OF REJECTABLE WELDS.
   3. THE SPECIAL INSPECTOR SHALL UPON DETECTION OF REJECTABLE WELD (EITHER VISUALLY OR BY NONDESTRUCTIVE TEST), THE INSPECTOR OF RECORD WILL NOTIFY THE WELDER AND HIS FOREMAN FOR VERIFICATION OF DEFECT. THE INSPECTOR OF RECORD WILL OBSERVE REMOVAL, REWORK, OR REPAIRS.
   4. THE SPECIAL INSPECTOR SHALL CHECK STRUCTURAL MEMBERS FOR THICKNESS ADJACENT TO WELDS, OPENING, ETC. REWORK, OR REPAIRS.
   5. THE SPECIAL INSPECTOR SHALL INSPECT JOINTS FOR PROPER PREPARATION, INCLUDING BEVEL, ROOT FACES, ROOT OPENING, ETC. REWORK, OR REPAIRS.
   6. THE SPECIAL INSPECTOR SHALL CHECK THE TYPE AND SIZE OF ELECTRODES TO BE USED FOR THE VARIOUS JOINTS, AND POSITIONS. CHECK THE STORAGE FACILITIES TO SEE IF THEY ARE ADEQUATE TO KEEP THE ELECTRODES DRY.
   7. THE SPECIAL INSPECTOR SHALL OBSERVE THE TECHNIQUE OF EACH THE SPECIAL INSPECTOR SHALL WELDER WITH USE OF A WELDING INSPECTION SHIELD.
   8. THE SPECIAL INSPECTOR SHALL VERIFY THE USE OF PROPER PREHEAT AND INTER PASS TEMPERATURES. INSPECTOR SHALL WELDER WITH USE OF A WELDING INSPECTION SHIELD.
   9. THE SPECIAL INSPECTOR SHALL CONTINUOUSLY OBSERVE MULTI-PASS WELDS. CONTINUOUS INSPECTION IS DEFINED AS FOLLOWS: THE INSPECTOR IS PRESENT IN THE WELDING AREA AT ALL TIMES AND IS FULLY AWARE OF THE PROGRESS OF THE WELDING AT ANY GIVEN TIME. THE INSPECTOR MAY WATCH MULTIPLE WELDERS PROVIDED THEY ALL BE IN THE AREA, CLOSE ENOUGH FOR EFFECTIVE VISUAL INSPECTION OF THE WORK PERFORMED.
   10. THE SPECIAL INSPECTOR SHALL DETERMINE THAT THE OPERATOR IS CAPABLE OF PRODUCING THE REQUIRED WELDS.
   11. THE SPECIAL INSPECTOR SHALL OBSERVE SINGLE PASS FILLET WELDS PERIODICALLY, OR MORE OFTEN IF CODES AND SPECIFICATIONS REQUIRE.
   12. THE SPECIAL INSPECTOR SHALL, IF STRAIGHTENING OR RESTRAINING OF WELDMENTS IS NECESSARY, VERIFY THAT APPROVED METHODS WILL BE USED.
   13. THE SPECIAL INSPECTOR SHALL TAG OR STAMP ACCEPTED WELDMENTS WITH THE INSPECTOR'S IDENTIFICATION STAMP. APPROVED METHODS WILL BE USED.

FLOOR METAL DECK

1. SHEET METAL:
   MATERIAL: ASTM A446, GRADE A,
   GALVANIZING: G90 ZINC COATED ACCORDING TO ASTM A525
   DECK PROFILE C
   PROFILE DEPTH: 0.6 INCHES
   GAUGE: 26
   SPAN 24
2. ATTACHMENT:
   AT SUPPORTS: #12 TEK SCREWS
   FASTENER LAYOUT 36/4
   AT SIDE LAPS: #10 TEK SCREWS
   SIDE LAPS 4 FASTENERS PER SPAN
3. TOPPING:
   WEIGHT: NORMAL WEIGHT CONCRETE
   STRENGTH 3000 PSI
   SLUMP 6 INCHES
   CONTROL JOINTS SPACED AT 15 FEET MAXIMUM AND OVER BEAMS
   THICKNESS t= 2 1/2 INCH
   THICKNESS (TOTAL) 3 INCH
   REINFORCEMENT 6x6-W2.9xW2.9

4. INSTALL DECK ENDS OVER SUPPORTING FRAMING WITH A MINIMUM END BEARING OF1.5" WITH END JOINTS LAPPED AT A MINIMUM OF TWO INCHES AND SHALL OCCUR OVER SUPPORTS.

5. SCREWS MUST BE INSTALLED USING PROPERLY CALIBRATED TOOLS TO AVOID OVERDRIVING WHICH CAN STRIP THE THREADS AT SIDE LAPS OR SEVER THE SCREW WHEN IT IS PLACED INTO HEAVIER SUBSTRATE.

6. WELDING OF METAL DECKING NOT ALLOWED. ALL METAL DECKING THAT HAS BEEN WELDED SHALL BE REMOVED AT CONTRACTORS EXPENSE. REMOVED METAL DECKING SHALL NOT BE USED.

7. DECK UNITS SHALL BE 3 OR MORE SPANS AND SHALL BE ATTACHED TO THE STRUCTURAL SUPPORT

ROOF METAL DECK

1. SHEET METAL:
   MATERIAL: ASTM A446, GRADE A,
   GALVANIZING: G90 ZINC COATED, ACCORDING TO ASTM A525
   DECK PROFILE B
   PROFILE DEPTH: 1.5 INCHES
   GAUGE: 18
   SPAN 5'-0"
2. ATTACHMENT:
   AT SUPPORTS: 5/8" PUDDLE WELDS
   FASTENER LAYOUT 36/7 (9" AT PERIMETER)
   AT SIDE LAPS: #10 TEK SCREWS
   SIDE LAPS 9 FASTENERS PER SPAN

3. INSTALL DECK ENDS OVER SUPPORTING FRAMING WITH A MINIMUM END BEARING OF1.5" WITH END JOINTS LAPPED AT A MINIMUM OF TWO INCHES AND SHALL OCCUR OVER SUPPORTS.

4. SCREWS MUST BE INSTALLED USING PROPERLY CALIBRATED TOOLS TO AVOID OVERDRIVING WHICH CAN STRIP THE THREADS AT SIDE LAPS OR SEVER THE SCREW WHEN IT IS PLACED INTO HEAVIER SUBSTRATE.

5. DECK UNITS SHALL BE 3 OR MORE SPANS AND SHALL BE ATTACHED TO THE STRUCTURAL SUPPORT

OPEN WEB STEEL JOISTS

1. ALL STEEL FOR JOISTS SHALL CONFORM TO THE STEEL JOIST INSTITUTE REQUIREMENTS FOR K-SERIES OPEN WEB JOISTS, AND VS-SERIES STEEL JOISTS, MINIMUM 50,000 PSI YIELD POINT.
2. ALL STEEL JOISTS SHALL RECEIVE MANUFACTURER'S STANDARD BASE PAINT, APPLIED BY DIPPING OR SPRAYING, BEFORE LEAVING THE SHOP
3. ALL STEEL JOISTS BEARING ON STEEL SHALL HAVE A MINIMUM 2 1/2" BEARING LENGTH AND SHALL BE WELDED TO THE STEEL WITH 2 WELDS AT EACH END, EACH 2 1/2" LONG. JOIST BEARING LESS THAN 2 1/2" SHALL BE DESIGNED BY THE JOIST SUPPLIER TO RESIST THE INCREASED STRESS. THE JOIST SUPPLIER SHALL SPECIFY SPECIAL JOIST SEATS AND ANCHORAGE REQUIREMENTS FOR DEFICIENT BEARING.
4. PROVIDE 2"x2"x1/4" ANGLE BOTTOM CHORD EXTENDS AT STEEL JOIST END AT COLUMN LINES OR AT JOIST NEAREST COLUMN LINES.
5. CHECK ARCHITECTURAL PLANS IF BOTTOM CHORD EXTENSIONS ARE REQUIRED.
6. BOTTOM CHORD EXTENDED ENDS SHALL NOT BE INSTALLED UNTIL AFTER ROOF HAS BEEN COMPLETELY INSTALLED.
7. ROOF TOP A/C UNITS SHALL HAVE AN OPERATING WEIGHT NOT TO EXCEED 500 LBS. AND SHALL BE LOCATED OVER A MINIMUM OF 2 JOISTS. ROOF TOP UNITS WEIGHING MORE THAN 500 LBS. SHALL BE LOCATED AS SHOWN ON THE MECHANICAL PLANS.
8. STEEL JOISTS TO BE DESIGNED PER DESIGN CRITERIA.
9. ALL STEEL JOISTS SHALL BE MANUFACTURED BY VULCRAFT OR SMI, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
10. PROVIDE ANGLES FOR SUPPORT AROUND OPENINGS AT METAL DECK.
11. STEEL JOIST SUPPLIER TO VERIFY THAT THE SPECIFIED JOIST MEET ALL THE MINIMUM REQUIREMENTS OF SJI BEFORE PROVIDING A BID.
12. MECHANICAL EQUIPMENT: SEE MECHANICAL PLANS. PIPES AND MECHANICAL EQUIPMENT SHALL BE SUPPORTED BY THE TOP CHORD OF THE STEEL JOISTS ONLY.
13. WHERE STEEL JOIST PASS THROUGH CMU WALLS, PROVIDE HALF INCH GAP BETWEEN THE CMU AND STEEL JOIST. PROVIDE ELASTOMERIC MATERIAL BETWEEN THE STEEL JOIST AND CMU.
14. PROVIDE CLOSURE ANGLE 3x3x3/8 AT ALL PERIMETER CONDITIONS TO FRAME OUT ALL ROOF PENETRATIONS UNLESS NOTED OTHERWISE.
15. JOISTS SHALL ALSO BE DESIGNED FOR AN ADDITIONAL 500 LB CONCENTRATED LOAD PLACED AT ANY POINT. THE MAXIMUM DEFLECTION SHALL BE L/600.

8A. PORTIONS OF WORK REQUIRING SPECIAL INSPECTION:		YES	NO	N/A
FOUNDATION	A. COMPACTED FILL, GRADING, AND EXCAVATIONS	X		
	B. CONTINUOUS INSPECTION OF PIERS	X		
CONCRETE	A. CONTINUOUS INSPECTION AND TEST CYLINDERS FOR CONCRETE.	X		
	B. CONTINUOUS INSPECTION FOR SLAB CONCRETE	X		
	C. TEST CYLINDERS FOR SLAB CONCRETE	X		
	D. ANCHOR BOLTS OR EMBEDS IN CONCRETE (INSTALLATION AND CONCRETE PLACEMENT)	X		
DRILLED IN ANCHORS	A. ALL ADHESIVE ANCHORS, RODS, DOWELS, SHALL BE CONTINUOUSLY INSPECTED DURING INSTALLATION.	X		
	B. ADDITIONAL TESTING MAY BE REQUIRED AS SPECIFIED ON THE PLANS.	X		
	C. ADHESIVE ANCHORS IN CONCRETE OR MASONRY	X		
REINFORCING STEEL	A. PLACING OF REINFORCING	X		
	B. SAMPLING AND TESTING STEEL (MILL REPORTS AND IDENTIFICATION OF STEEL)	X		
WELDING	A. ALL STRUCTURAL WELDING EXCEPT WELDING IN APPROVED SHOPS.	X		
	B. ULTRASONIC TESTING OF FULL PENETRATION WELD CONNECTIONS , AND FIELD WELDS.	X		
	C. STRUCTURAL LIGHT GAGE METAL FRAME WELDING.	X		
	D. REINFORCING STEEL WELDING	X		
BOLTING	A. HIGH STRENGTH BOLT A325 & A490 (TORQUE VERIFICATION)	X		
	B. HIGH STRENGTH BOLT A325N,X & A480N,X (SNUG CONTACT OF PLYS)	X		
MASONRY	A. SAMPLING OF MASONRY UNITS	X		
	B. MASONRY PRISM CONSTRUCTION	X		
	C. MORTAR SAMPLING	X		
	D. CONTINUOUS INSPECTION DURING PLACEMENT AND GROUTING OF MASONRY UNITS AND REINFORCEMENT PLACEMENT.	X		
	E. ANCHOR BOLTS OR EMBEDS IN MASONRY (INSTALLATION AND GROUT PLACEMENT)	X		
INSULATING CONCRETE FILL	A. TEST CYLINDERS AND INSPECTIONS	X		
STRUCTURAL STEEL	A. MILL REPORTS AND IDENTIFICATION OF STEEL (AFFIDAVIT OF COMPLIANCE)	X		
	B. SAMPLING AND TESTING	X		
	C. DURING PLACEMENT OF PAINT AS SPECIFIED BY THE ARCHITECT.	X		
SHEAR DIAPHRAGMS	A. INSPECTION OF SHEATHING PLACEMENT AND NAIL SPACING	X		
APPROVED FABRICATORS	APPROVED FABRICATORS: MUST SUBMIT CERTIFICATE OF COMPLIANCE FOR ALL OFF SITE FABRICATION SUCH AS STRUCTURAL STEEL GLU-LAMS PRECAST CONCRETE, ETC.	X		
STRUCTURAL OBSERVATION	STRUCTURAL OBSERVATIONS REQUIRED. WHEN REQUIRED BY THIS ENGINEER OR THE BUILDING DEPARTMENT, THE CONTRACTOR SHALL EMPLOY AN ENGINEER APPROVED BY THE EOR TO PERFORM STRUCTURAL OBSERVATION.	X		

REINFORCED CONCRETE MASONRY UNITS

1. CONCRETE MASONRY UNITS (CMU) SHALL CONFORM TO ASTM C90, AND AS FOLLOWS:
   * UNIT COMPRESSIVE STRENGTH: 1900 PSI MINIMUM AVERAGE NET AREA COMPRESSIVE STRENGTH.
   * WEIGHT CLASSIFICATION: MEDIUM WEIGHT BLOCK
   * GROUT f'c = 3000 PSI
   * MORTAR SHALL BE TYPE S
   * CONCRETE MASONRY ASSEMBLAGE (f'm) SHALL BE 1500 PSI
2. ALL REINFORCING BARS SHALL BE NEW BILLET STEEL AND SHALL CONFORM TO ASTM A-615, GRADE 60, REINFORCING BARS #3 AND SMALLER MAY BE GRADE 40.
3. CONCRETE SHALL CONFORM TO ASTM C150 TYPE I, LOW ALKALI, MASONRY CEMENTS ARE NOT ALLOWED.
4. TYPICAL REINFORCEMENT, U.N.O. (DRAWING NOTES GOVERN OVER THESE NOTES)

CMU		VERTICAL	HORIZONTAL	OPENINGS AND DOWELS	CORNERS
ZZZZ	8"	#6 AT 32" O.C.	#5 AT 96" O.C.	(2) #5	(3) #5
	6"	#4 AT 48" O.C.	#4 AT 96" O.C.	(1) #4	(3) #4
XXXX	12"	(2) #6 AT 16" O.C.	(2) #5 AT 96" O.C.	(2) #6	(3) #6

■ INDICATES CMU WALL/COLUMN/PILASTER REINFORCED PER DETAIL 1/S402
ALL VERTICAL REINFORCEMENT TO BE IN CONCRETE OR GROUT FILLED CELLS, PROVIDE DOWELS FROM FOUNDATION, SAME SIZE AND SPACING.
5. TYPICAL HORIZONTAL REINFORCEMENT SHALL BE TWO (2) #5 CONTINUOUS IN 8"x16" DEEP CONTINUOUS CONCRETE FILLED BOND BEAM BELOW EACH FLOOR AND ROOF LEVEL, UNLESS NOTED OTHERWISE. PROVIDE STANDARD DUR-O-WALL TRUSS-TYPE REINFORCING OR REVIEWED EQUIVALENT EVERY OTHER COURSE (16" ON CENTER) AND AS PER MANUFACTURER'S RECOMMENDATIONS. (9 GAGE MINIMUM GALVANIZED)
6. VERTICAL CELLS TO BE FILLED SHALL HAVE VERTICAL ALIGNMENT SUFFICIENT TO MAINTAIN A CLEAR, UNOBSTRUCTED CONTINUOUS VERTICAL.
7. WALL LENGTHS LESS THAN OR EQUAL TO FOUR (4) TIMES ITS THICKNESS SHALL BE CONSIDERED COLUMN SECTIONS AND SHALL BE REINFORCED WITH #5 VERTICAL REINFORCING IN FILLED CELLS, PROVIDE 1/4 INCH DIAMETER TIES EVERY COURSE (8" ON CENTER) IN LIEU OF DUR-O-WALL REINFORCING, PLACE TIES NOT LESS THAN 1 1/2" NOR MORE THAN 5" FROM THE SURFACE OF THE COLUMN.
8. ALL CELLS CONTAINING VERTICAL REINFORCEMENT SHALL BE FILLED SOLIDLY WITH PEA GRAVEL CONCRETE (3/8" MAX. AGGREGATE SIZE) OR GROUT, EACH WITH A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS, GROUT OR CONCRETE SHALL BE A WORKABLE MIX SUITABLE FOR PUMPING WITHOUT SEGREGATION AND SHALL BE THOROUGHLY MIXED, GROUT OR CONCRETE SHALL BE PLACE BY PUMPING OR AN APPROVED ALTERNATE METHOD AND SHALL BE PLACED BEFORE INITIAL SET OR HARDENING OCCURS. GROUTING SHALL BE PER NCMA TEK 3-2
9. ALLOW C.M.U. WALLS TO SET AT LEAST 24 HOURS AFTER COMPLETION BEFORE GROUTING, GROUT OR CONCRETE SHALL BE CONSOLIDATED BY RESOLIDATION AFTER EXCESS MOISTURE HAS BEEN ABSORBED BUT BEFORE WORKABILITY IS LOST, THE FILLING OF ANY SECTION OF A WALL SHALL BE COMPLETED IN ONE DAY WITHOUT INTERRUPTIONS GREATER THAN ONE HOUR, AND PLACED IN LAYERS OF 4 FEET MAXIMUM.
10. WHERE THE CONCRETE OR GROUT POUR EXCEEDS 4 FEET IN HEIGHT, CLEANOUTS SHALL BE PROVIDED BY SUITABLE OPENINGS IN THE FACE SHELLS IN THE BOTTOM COURSE OF EACH CELL TO BE FILLED, OR OTHER APPROVED LOCATIONS, THE CLEANOUTS SHALL BE SEALED AFTER INSPECTION AND BEFORE BEING FILLED.
11. WHEN CELL FILLING IS STOPPED FOR ONE HOUR OR LONGER, HORIZONTAL CONSTRUCTION JOINT SHALL BE FORMED BY STOPPING THE POUR OF CONCRETE OR GROUT APPROXIMATELY 1/2 INCH ABOVE OR BELOW BED JOINT.
12. END WALLS AND CROSS WEBS FORMING CELLS TO BE FILLED SHALL BE FULL BEDDED IN MORTAR TO PREVENT LEAKAGE OF CONCRETE OR GROUT UNLESS WALL IS TO BE POURED SOLID.
13. PROVIDE VERTICAL CONTROL JOINTS AT A MAXIMUM SPACING OF 24' (10' FROM CORNERS. DO NOT CONTINUE THE TYPICAL TRUSS TYPE JOINT REINFORCEMENT THROUGH THE JOINT. BOND BEAM REINFORCEMENT SHALL BE CONTINUOUS THROUGH THE JOINT.
14. DURING ERECTION, COVER TOP OF WALLS, PROJECTIONS AND SILLS WITH WATERPROOF SHEATHING AT THE END OF EACH DAY'S WORK.

A. PREINSTALLATION CONFERENCE:
1. AT LEAST 15 DAYS PRIOR TO THE START OF THE MASONRY CONSTRUCTION SCHEDULE, THE CONTRACTOR SHALL CONDUCT A MEETING TO REVIEW THE PROPOSED MIX DESIGNS, MATERIALS AND TO DISCUSS THE REQUIRED METHODS AND PROCEDURES TO ACHIEVE THE REQUIRED MASONRY CONSTRUCTION. THE CONTRACTOR SHALL SEND A PRE-CONCRETE CONFERENCE AGENDA TO ALL ATTENDEES 20 DAYS PRIOR TO THE SCHEDULED DATE OF THE CONFERENCE.
2. THE CONTRACTOR SHALL REQUIRE RESPONSIBLE REPRESENTATIVES OF EVERY PARTY CONCERNED WITH THE MASONRY WORK TO ATTEND THE CONFERENCE, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
   A) CONTRACTOR'S SUPERINTENDENT
   B) LABORATORY RESPONSIBLE FOR CONCRETE MIXES AND/ OR FIELD QUALITY CONTROL AND SPECIAL INSPECTOR
   C) READY-MIX CONCRETE PRODUCER
   D) MASONRY SUBCONTRACTOR
3. MINUTES OF THE MEETING SHALL BE RECORDED, TYPED AND PRINTED BY THE CONTRACTOR AND DISTRIBUTED BY HIM TO ALL CONCERNED PARTIES, INCLUDING THE OWNER'S REPRESENTATIVE, THE ARCHITECT, AND THE STRUCTURAL ENGINEER WITHIN FIVE DAYS OF THE MEETING.

STRUCTURAL MASONRY (SPECIAL INSPECTION)

INSPECTION TASK (MONITOR MATERIAL AND WORKMANSHIP TO ASSURE CONTRACT DOCUMENTS ARE BEING FOLLOWED)	INSPECTION: CONTINUOUS DURING TASK LISTED	INSPECTION: PERIODICALLY DURING TASK LISTED
1. AS MASONRY CONSTRUCTION BEGINS, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:		
A. PROPORTIONS OF SITE PREPARED MORTAR.	X	
B. CONSTRUCTION OF MORTAR JOINTS.	X	
C. LOCATION OF REINFORCEMENT AND CONNECTORS.	X	
2. THE INSPECTION PROGRAM SHALL VERIFY:		
A. SIZE AND LOCATION OF STRUCTURAL ELEMENTS.	X	
B. TYPE, SIZE AND LOCATION OF DOWELS, ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES AND OTHER CONSTRUCTION	X	
C. CHECK GROUT MIX FOR COMPLIANCE WITH CODE AND SPECIFICATIONS.	X	
D. WELDING OF REINFORCING BARS.	X	
E. PROTECTION OF MASONRY DURING COLD WEATHER (TEMP. BELOW 40 °F) OR HOT	X	
WEATHER (TEMP. ABOVE 90 °F).	X	
F. CUTTING OF CLEAN OUT HOLES, KNOCKING DOWN OF FINS AND REMOVAL OF DEBRIS.		
G. VERIFY THAT MATERIALS ARE PROPERLY STORED.		
H. VERIFY THE LOCATION OF THE CONTROL JOINTS.		
3. PRIOR TO GROUTING, THE FOLLOWING SHALL BE VERIFIED TO ENSURE COMPLIANCE:		
A. GROUT SPACE IS CLEAN.	X	
B. PLACEMENT OF REINFORCEMENT AND CONNECTOR. (CHECK CLEARANCE, LAP SPLICES, STAGGER AND OFFSETS)	X	
C. CHECK GROUT MIX FOR COMPLIANCE WITH CODE AND SPECIFICATIONS.	X	
D. CONSTRUCTION OF MORTAR JOINTS.	X	
E. CHECK INSTALLATION OF CLEAN OUT CLOSURE.	X	
4. GROUT PLACEMENT SHALL BE VERIFIED TO ENSURE COMPLIANCE WITH CODE AND CONSTRUCTION DOCUMENT PROVISIONS. (SUCH AS MECHANICAL VIBRATION DURING PLACEMENT AND LATER DURING RECONSOLIDATION.)	X	
5. PREPARATION OF ANY REQUIRED GROUT SPECIMENS, MORTAR SPECIMENS AND/OR PRISMS SHALL BE OBSERVED.	X	
6. COMPLIANCE WITH REQUIRED INSPECTION PROVISIONS OF THE PROVISIONS OF THE CONSTRUCTION DOCUMENTS AND THE APPROVED SUBMITTALS SHALL BE VERIFIED.	X	
7. CHECK THAT CURING REQUIREMENTS ARE BEING FOLLOWED	X	
8. VERIFY PLACEMENT OF ANCHORS INTO CONCRETE MASONRY UNITS.	X	
9. FREQUENCY OF TESTS: A. CONCRETE MASONRY UNIT TEST- FOR EACH TYPE, CLASS, AND GRADE OF CONCRETE MASONRY UNIT INDICATED, TEST UNITS BY METHOD OF SAMPLING AND TESTING OF ASTM C140. ONE SET OF CMU STANDARD PRISM TEST SHALL BE CONDUCTED FOR EVERY 5,000 SQ. FT. OF WALL DURING CONSTRUCTION IN ACCORDANCE TO ASTM C1314, BUT NOT LESS THAN ONE SET OF 3 MASONRY PRISMS FOR THE PROJECT. B. MORTAR TEST: FOR EACH TYPE INDICATED, TEST MORTAR BY METHODS OF SAMPLING AND TESTING OF ASTM C780. CONDUCT TESTS NO LESS FREQUENTLY THAN THAT REQUIRED TO EVALUATE MORTAR USED TO INSTALL EACH INCREMENT OF MASONRY UNITS INDICATED ABOVE FROM WHICH SAMPLES ARE TAKEN FOR TESTING. TEST MORTAR FOR EVERY 1,500 SQ. FT. OF WALL CONSTRUCTION. C. GROUT TEST: AT START OF GROUTING OPERATION, TAKE ONE TEST PER DAY FOR FIRST 3 DAYS. EACH GROUT TEST CONSISTS OF THREE SPECIMENS MADE IN ACCORDANCE WITH ASTM C1019. AFTER FIRST THREE TESTS, SPECIMENS FOR CONTINUING QUALITY CONTROL SHOULD BE TAKEN ONCE A WEEK FOR EVERY 25 CUBIC YARDS OF GROUT OR FOR EVERY 2,500 SQ. FT. OF WALL, WHICHEVER COMES FIRST.	X	
10. MASONRY TESTING REQUIREMENTS	X	

TESTING METHOD OPTIONS	PRIOR TO CONSTRUCTION	DURING CONSTRUCTION
METHOD 1: MASONRY PRISM TESTING	5 PRISMS	3 PRISMS FOR EVERY 5,000 S.F. OF WALL
METHOD 2: MASONRY PRISM TEST RECORD	APPROVED 30 PRISM RECORD	3 PRISMS FOR EVERY 5,000 S.F. OF WALL
METHOD 3: UNIT STRENGTH METHOD	UNITS AND GROUT OR 5 PRISM	UNITS AND GROUT OR 3 PRISMS FOR EVERY 5,000 S.F. OF WALL

PERIODIC INDICATES AT A MINIMUM ONCE A DAY FOR A MINIMUM OF ONE HOUR

FOUNDATION NOTES

1. FOR GENERAL NOTES SEE SHEET S101 AND S102
2. FOR TYPICAL DETAILS SEE SHEETS NUMBER S400'S
3. CONTRACTOR/SUBCONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS WITH ARCHITECTURAL PLANS BEFORE COMMENCING ANY WORK. THE CONTRACTOR AND OR SUBCONTRACTOR SHALL REPORT ANY DISCREPANCIES TO THE ARCHITECT AND ENGINEER BEFORE THE WORK HAS BEGUN.
4. REFER TO ARCHITECTURAL PLANS FOR ADDITIONAL DIMENSIONS.
5. REFER TO ARCHITECTURAL PLANS FOR FLOOR DRAIN LOCATIONS.
6. SLOPE SLAB TO DRAINS, SEE ARCHITECTURAL PLANS FOR SLOPE.
7. REFER TO ARCHITECTURAL PLANS FOR FLOOR FINISHES. ENGINEER IS NOT RESPONSIBLE FOR TYPE OF FLOOR FINISHES.
8. THE TESTING LABORATORY SHALL BE THE OWNERS REPRESENTATIVE TO CONTROL THE PLACEMENT OF COMPACTED FILL. THE TESTING LABORATORY SHALL APPROVE THE SUBGRADE PREPARATION, THE FILL MATERIALS, THE METHOD OF PLACEMENT AND COMPACTION, AND COMPACTION, AND SHALL GIVE WRITTEN APPROVAL OF THE COMPLETED FILL. THE TESTING LABORATORY SHALL INDICATE ON THERE REPORT THE ELEVATION OF THE COMPACTED SUBGRADE.
9. ALL EARTHWORK AND GRADING SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEERING STUDY. THE MORE STRINGENT REQUIREMENTS BETWEEN THESE SUBGRADE NOTES AND GEOTECHNICAL ENGINEERING STUDY SHALL GOVERN AND EXECUTED BY THE CONTRACTOR.
10. IN THE EVENT FOUNDATION EXCAVATIONS ARE CARRIED TO A DEPTH GREATER THAN REQUIRED, THE ADDITIONAL DEPTH SHALL BE FILLED WITH THE SAME CONCRETE AS THAT USED FOR FOOTING AT NO ADDITIONAL EXPENSE TO THE OWNER. NO UNCONTROLLED FILL WILL BE PERMITTED.
11. THE FOOTING EXCAVATIONS SHALL BE KEPT FREE FROM LOOSE MATERIAL AND STANDING WATER.
12. THE FOUNDATION EXCAVATIONS SHOULD BE OBSERVED BY THE TESTING LABORATORY PRIOR TO STEEL OR CONCRETE PLACEMENT TO ASSESS THAT THE FOUNDATION MATERIALS ARE CAPABLE OF SUPPORTING THE DESIGN LOADS AND ARE CONSISTENT WITH THE MATERIALS DISCUSSED IN THE STUDY. THIS IS ESPECIALLY IMPORTANT TO IDENTIFY THE ACCEPTABILITY OF THE SUBGRADE OR FILL MATERIAL UNDER THE FOOTING. SOFT OR LOOSE SOIL ZONES ENCOUNTERED AT THE BOTTOM OF THE FOOTING OR BEAM EXCAVATIONS SHOULD BE EXCAVATIONS SHOULD BE REMOVED TO THE LEVEL OF COMPETENT SOIL AS DIRECTED BY THE TESTING LABORATORY. CAVITIES FORMED AS A RESULT OF EXCAVATION OF SOFT OR LOOSE SOIL ZONES SHOULD BE BACKFILLED WITH LEAN CONCRETE OR SELECT FILL AS DETERMINED BY THE TESTING LABORATORY.
13. CARE SHOULD BE TAKEN TO SHAPE THE BUILDING AREAS SUCH THAT WATER WILL NOT POND AROUND THE STRUCTURE DURING CONSTRUCTION AND CAUSE THE NEAR SURFACE CLAYS TO SWELL. THE PROPOSED STRUCTURE SHALL BE ISOLATED FROM ANY MOISTURE SOURCE WHICH MIGHT ALSO CAUSE SWELLING OF THE CLAYS AFTER COMPLETION OF THE CONSTRUCTION.
14. WHEN THE STRUCTURE IS COMPLETE, THE GROUND SURFACE SHOULD SLOPE AWAY FROM THE STRUCTURE AND DOWN SPOUTS SHOULD CARRY RUNOFF WATER SEVERAL FEET FROM THE BUILDING, PREFERABLY INTO PAVED AREAS OR SEWERS, BEFORE DISCHARGING.
15. DO NOT PLANT, OR LEAVE IN PLACE, DEEP ROOTED TREES WITHIN CLOSE PROXIMITY TO THE PERIMETER OF THE STRUCTURE. DEEP ROOTED TREES HAVE POTENTIAL TO REMOVE MOISTURE FROM BENEATH THE BUILDING IF PLANTED CLOSE ENOUGH TO ALLOW THE ROOT BULB EXTEND NEAR OR BENEATH THE BUILDING.
16. AIR CONDITIONING CONDENSER DRAIN LINES TO DISCHARGE WATER A MINIMUM OF 5 FEET FROM THE PERIMETER OF THE STRUCTURE. THE DISCHARGE AREA SHALL HAVE SUFFICIENT SLOPE AWAY FROM THE STRUCTURE TO PREVENT STANDING WATER.
17. THE FINAL ONE (1) FOOT OF FILL OUTSIDE THE BUILDING AREA SHOULD CONSIST OF A COHESIVE CLAYEY (CL) SOIL. FILL CAN NOT BE ALLOWED TO DRY OUT DURING OR AFTER COMPACTION. (P1 BETWEEN 15 AND 25)
18. NOTE THAT SOME LEVELS OF RISK ARE ASSOCIATED WITH ALL FOUNDATION SYSTEMS AND THERE IS NO SUCH THING AS A "ZERO RISK" FOUNDATION. IT ALSO SHOULD BE NOTED THAT THE FOUNDATION PROVIDED IS NOT DESIGNED TO RESIST SOIL MOVEMENT AS A RESULT OF SEWER/PLUMBING LEAKS, EXCESSIVE IRRIGATION, NON UNIFORM IRRIGATION, POOR DRAINAGE, AND WATER PONDING NEAR THE FOUNDATION SYSTEM.
19. CONSTRUCTION FOLLOWING WET WEATHER PERIODS WILL LIKELY ENCOUNTER DIFFICULTIES DUE TO THE WET OR SOFT SURFACE SOILS BECOMING A GENERAL HINDRANCE TO EQUIPMENT DUE TO RUTTING AND PUMPING OF THE SOIL SURFACE. IF THE SUBGRADE CANNOT BE ADEQUATELY COMPACTED TO MINIMUM DENSITIES AS DESCRIBED ABOVE, ONE OF THE FOLLOWING MEASURES WILL BE REQUIRED:
    a) REMOVAL AND REPLACEMENT WITH SELECT FILL;
    b) CHEMICAL TREATMENT OF THE SOIL TO DRY SOIL AND INCREASE THE STABILITY OF THE SUBGRADE,
    c) DRYING BY NATURAL MEANS.

SLAB ON GRADE, Mechanical Rooms	
THICKNESS	7.5 INCHES
REINFORCING (EACH WAY)	#4 AT 10" O.C.
REINFORCING LOCATION	2.5" from top
VISQUEEN	15 MIL

SLAB ON GRADE at administration	
THICKNESS	5.0 INCHES
REINFORCING (EACH WAY)	#4 AT 14" O.C.
REINFORCING LOCATION	MID DEPTH
VISQUEEN	15 MIL

SLAB ON GRADE around pool	
THICKNESS	6.0 INCHES
REINFORCING (EACH WAY)	#4 AT 12" O.C.
REINFORCING LOCATION	2.5" from top of slab
VISQUEEN	15 MIL

Provide 6" house keeping pads with #4 at 12" o.c. each way. dowel slab into slab on grade with #3 at 12" o.c. each way

SUBGRADE PREPARATION

1. SITE PREPARATION
A. PREPARATION OF EXISTING GROUND
   ALL AREAS TO SUPPORT SELECT FILL SHALL BE STRIPPED OF
   ALL VEGETATION AND/OR ORGANIC TOPSOIL: 8 INCHES
   ADDITIONAL DEPTH OF REMOVAL: 3.5 FEET
   EXTEND BEYOND BUILDING FOOT PRINT: 5 FEET
   EXPOSED SUBGRADE SHALL BE SCARIFIED TO A DEPTH OF: 8 INCHES
   MOISTURE: (OPTIMUM MOISTURE CONTENT) 0 TO +4%
   COMPACTION (ASTM D-698) (MAXIMUM DENSITY): 95%
B. SELECT FILL MATERIAL
   AMOUNT OF COMPACTED SELECT FILL 68* INCHES
   NO ORGANIC OR OTHER PERISHABLE MATERIAL
   NO STONES LARGER THAN 2 INCHES
   *FINISHED FLOOR SHALL BE AS INDICATED ON CIVIL DRAWINGS, INCREASE INDICATED AMOUNT OF FILL AS REQUIRED TO ACHIEVE MOST STRINGENT REQUIREMENT. INCREASE EXCAVATION AS REQUIRED TO MEET MINIMUM AMOUNT OF SELECT FILL

   SELECT FILL SHALL MEET Tx DOT 2004 STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS AND BRIDGES, ITEM 247 FLEXIBLE BASE, TYPE A, TYPE B, OR TYPE C GRADES I THROUGH 3
C. PLACING SELECT FILL
   FILL LIFTS (LOOSE MEASURE, NOT EXCEEDING): 8 INCHES
D. COMPACTION OF SELECT FILL
   -2 TO +2
   COMPACTION (ASTM D-698) (MAXIMUM DENSITY): 98%
E. COMPACTION TESTING
   ATTERBERG LIMITS (ONE AT A RATE OF): 5,000 CU. YDS.
   COMPACTION (ONE TEST PER): 3,000 SQ. FT./ LIFT (MIN. OF 3 PER LIFT)

MASONRY LAYOUT NOTES

1. FOR GENERAL NOTES SEE SHEET **S101**, **S102** AND **S103**.
2. FOR TYPICAL DETAILS SEE **S400** SHEETS.
3. DIMENSIONS SHOWN ARE FOR GENERAL INFORMATION. COORDINATE WITH ARCHITECTURAL PLANS.
4. SEE MECHANICAL PLANS FOR MECHANICAL OPENINGS.
5. SEE DETAIL **4/S402** REINFORCING AT WINDOW, DOOR AND OPENING JAMBS.

CMU		VERTICAL	HORIZONTAL	OPENINGS AND DOWELS	CORNERS
ZZZZ	8"	#6 AT 24" O.C.	#5 AT 96" O.C.	(2) #5	(3) #5
	6"	#4 AT 48" O.C.	#4 AT 96" O.C.	(1) #4	(3) #4
XXXX	12"	(2) #6 AT 8" O.C.	(2) #5 AT 96" O.C.	(2) #6	(3) #6
IIII	12"	(2) #6 AT 8" O.C.	(2) #6 AT 24" O.C.	(2) #6	(3) #6

■ INDICATES CMU WALL/COLUMN/PILASTER REINFORCED PER DETAIL **1/S402**

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F-1616

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR., PE 83066 ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

General Notes

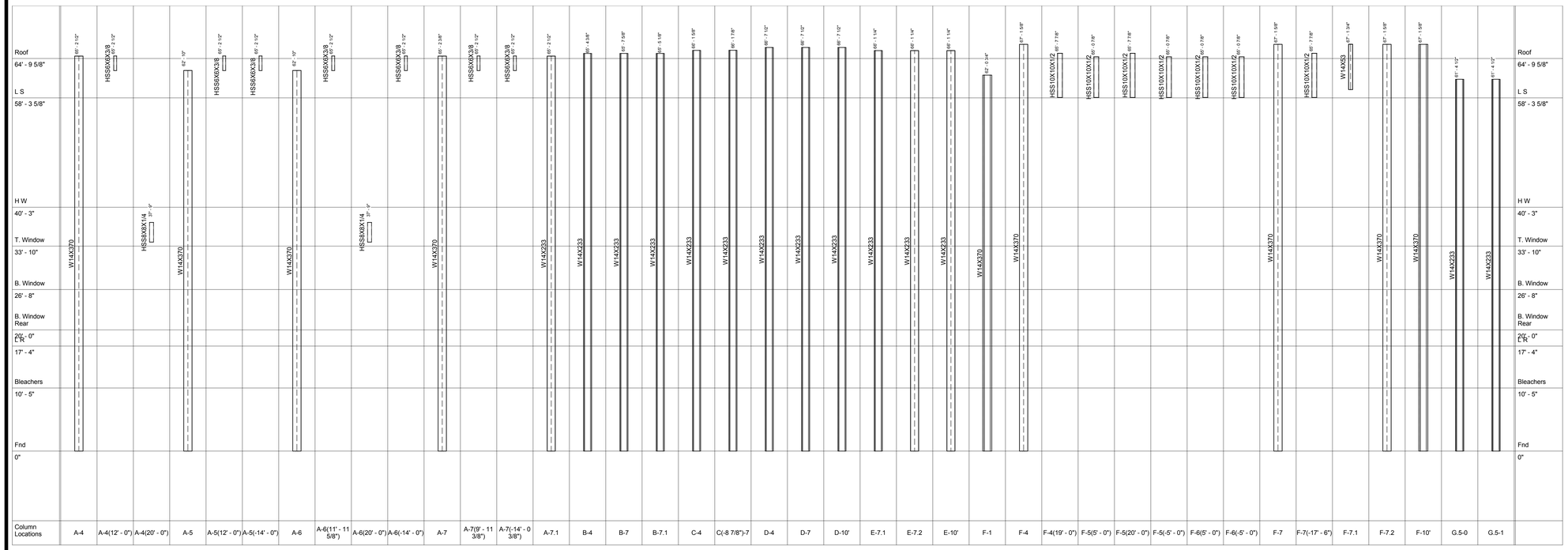
Document issued for:
Construction Documents

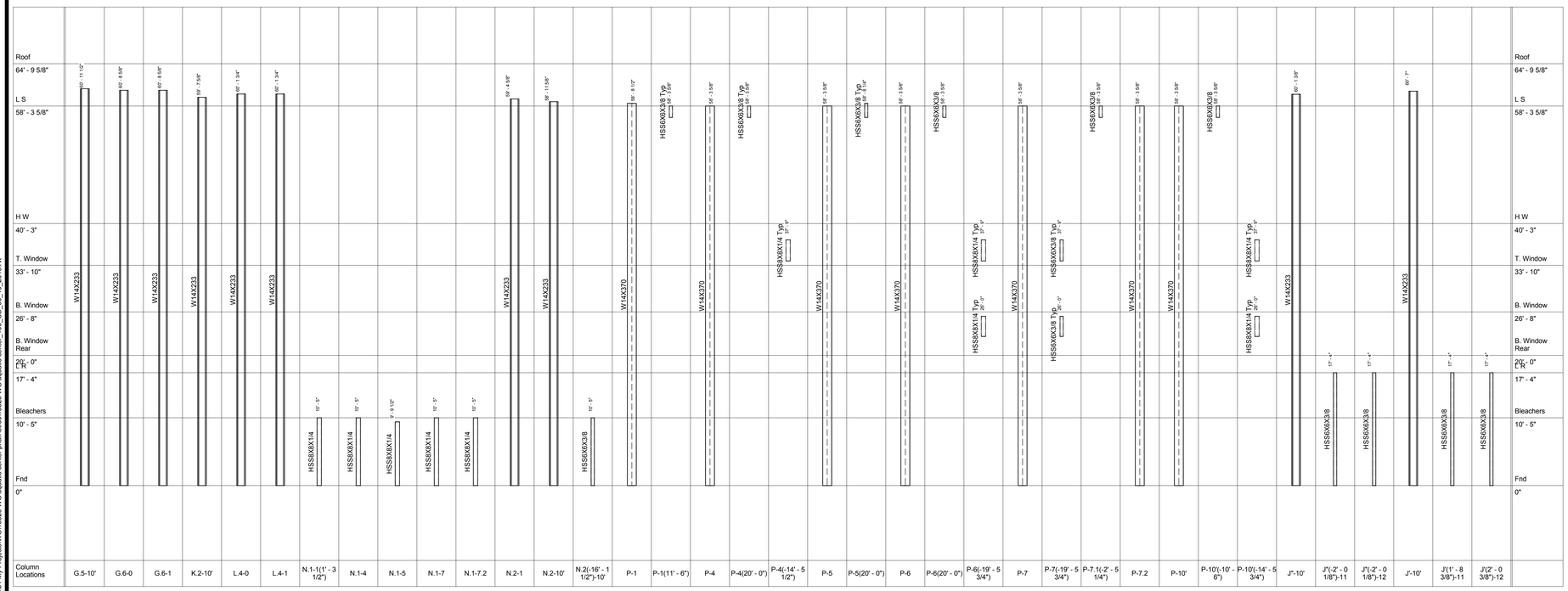
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S102





Pier Schedule			
Type Mark	Description	Base Level	Base Offset
Pier 2430	Pier 24" dia. x 30 ft deep	Fnd	-30' - 0"
Pier 2430	Pier 24" dia. x 30 ft deep	Fnd	-30' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-40' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-50' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-50' - 0"
Pier 3060	Pier 30" dia x 60' deep	Fnd	-60' - 0"
Pier 3060	Pier 30" dia x 60' deep	Fnd	-60' - 0"

99
Structural Pier Cap Schedule

Mark	Type	Width	Foundation Thickness	Reinforcing Longitudinal Quantity	Reinforcing Longitudinal Size	Reinforcing Transverse Size	Reinforcing Transverse Spacing
PC-01	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-02	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-03	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-04	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-05	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-06	36" x 36" x 36" Pier cap	3' - 0"	3' - 0"	4	6	6	10"
PC-07	126" x 126" x 48" Pier cap	10' - 6"	4' - 0"	13	8	8	10"
PC-08	126" x 126" x 72" Pier cap	10' - 6"	6' - 0"	13	8	8	10"

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 AND DATED. RELEASED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Schedules

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S103

6/11/2019 12:01:53 PM H:\Shandle\Personal Folders\01 My Projects\WGI\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

4'-0" thk. pile cap with #8 at 12" o.c. each way
Top and bottom. Add (6) #8 at 8" o.c. each way
under steel beam extending from pier to pier.
Typical at both pier caps

Pier Layout Plan
3/32" = 1'-0"

1
S205 S201

Pier Schedule			
Type Mark	Description	Base Level	Base Offset
Pier 2430	Pier 24" dia. x 30 ft deep	Fnd	-30' - 0"
Pier 2430	Pier 24" dia. x 30 ft deep	Fnd	-30' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-40' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-50' - 0"
Pier 2450	Pier 24" dia. x 50 ft deep	Fnd	-50' - 0"
Pier 3060	Pier 30" dia x 60' deep	Fnd	-60' - 0"
Pier 3060	Pier 30" dia x 60' deep	Fnd	-60' - 0"

99

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Pier Layout Plan

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S201

6/11/2019 12:01:54 PM H:\Shared\w\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F-1615

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. ANY UNSEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS UNSIGNED. ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Foundation Plan

Document issued for:
Construction Documents

PROPOSED

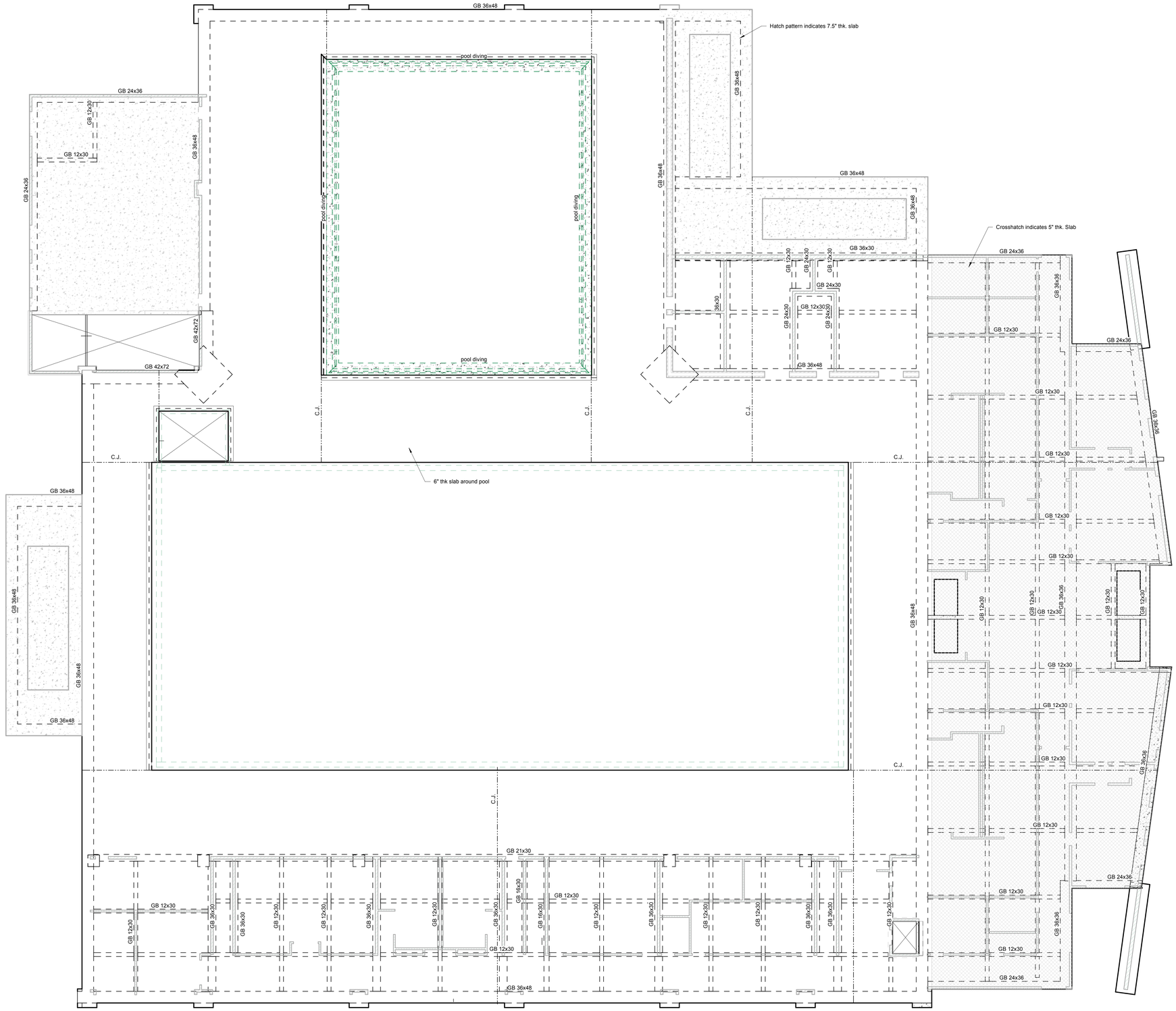
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S202

Foundation Plan
3/32" = 1'-0"
1 S205 S202

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



Foundation Plan, Grade Beams
3/32" = 1'-0"
1 S205 S203

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Foundation Plan, Grade Beams

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S203

6/11/2019 12:01:56 PM H:\Shared\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1515

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. RELEASED FOR NOT TO BE USED FOR CONSTRUCTION PURPOSES. ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Column Layout Plan

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

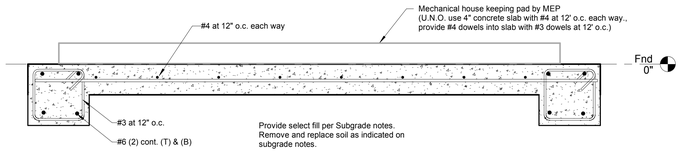
Project: 18323
Date: 6/7/2019

S204

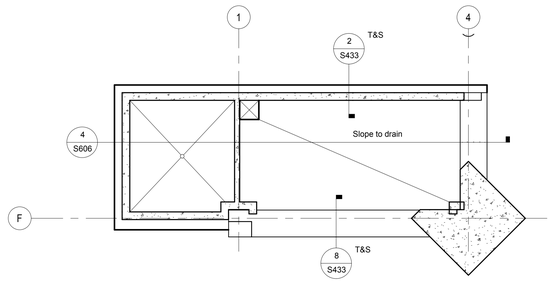
Column Layout Plan
3/32" = 1'-0"
1
S205 S204

6/11/2019 12:01:58 PM H:\Shanelle\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struc\18323 WG aquatic center_100_CD_06_10_2019.rvt

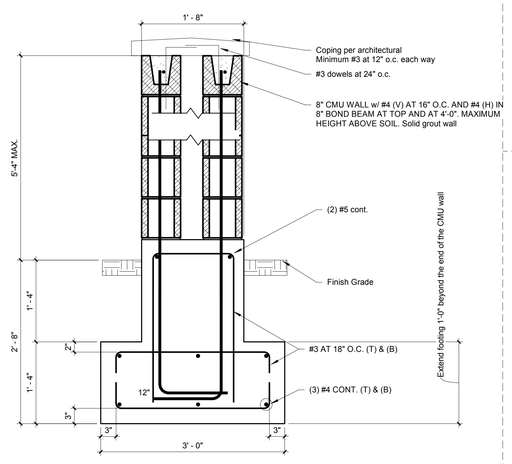
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1616



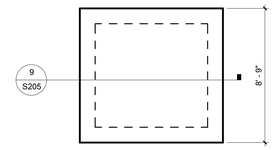
Typical Mechanical Pad Section — 9 (S205)
1" = 1'-0"



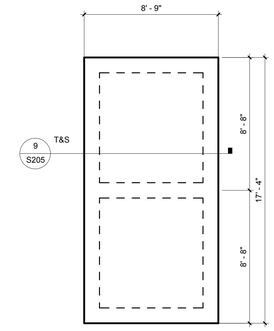
Mechanical Pit Foundation Plan — 10 (S433, S205)
1/8" = 1'-0"



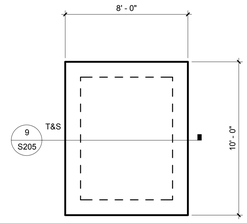
Footing at CMU Monument Sign — 6 (S205)
1" = 1'-0"



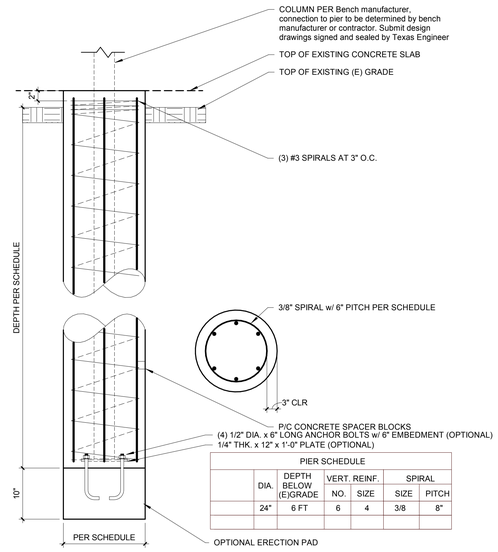
Foundation Plan, Misc. - Mechanical Pad 1 — 1 (S205, S205)
1/4" = 1'-0"



Foundation Plan, Misc. - Mech. Pad 2 & 3 — 2 (S205, S205)
1/4" = 1'-0"



Foundation Plan, Misc. - Student Canopies, 1, 2 and 3 — 3 (S205, S205)
1/4" = 1'-0"



PIER SCHEDULE						
	DIA.	DEPTH BELOW (E)GRADE	VERT. REINF. NO.	VERT. REINF. SIZE	SPIRAL SIZE	SPIRAL PITCH
	24"	6 FT	6	4	3/8	8"

Pier at Bench — 8 (S205)
1" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS PROHIBITED. ANY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Misc. Structures

Document issued for:
Construction Documents

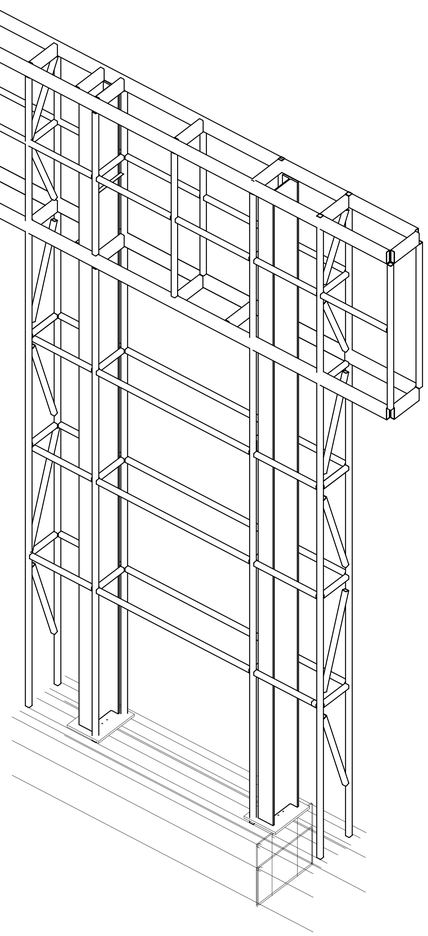
PROPOSED

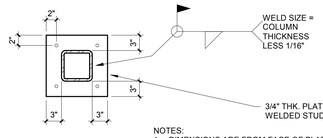
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S205

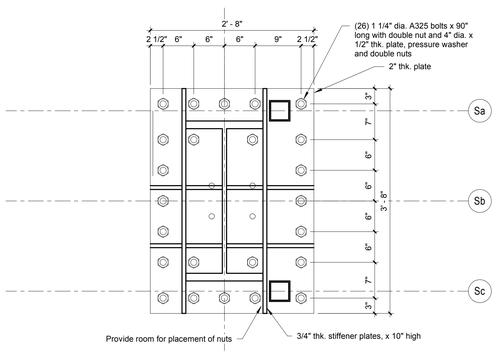
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



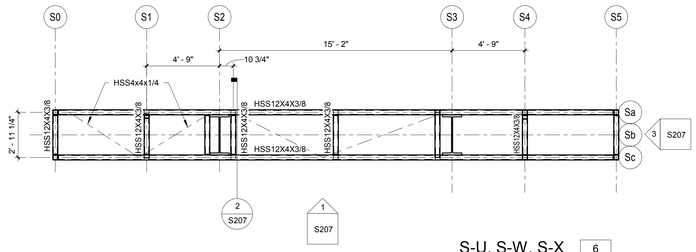


NOTES:
1. DIMENSIONS ARE FROM FACE OF PLATE TO FACE OF COLUMN
2 DIMENSIONS FOR WELDED STUDS ARE FROM FACE OF PLATE TO CENTERLINE OF STUD

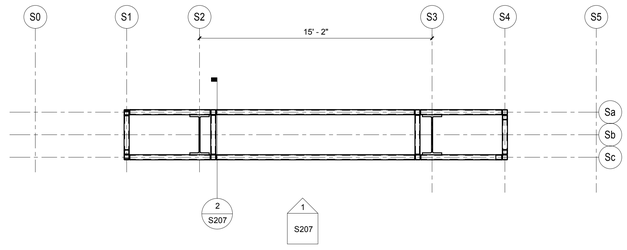
Steel Column Base Plate at Sign
1" = 1'-0"
7 | S206



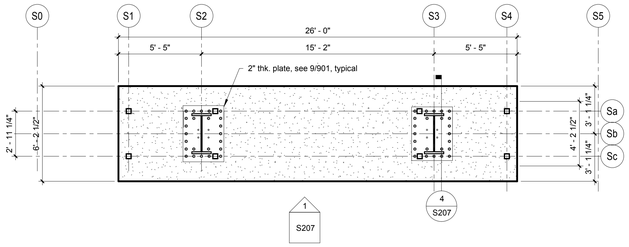
Base Plate
1" = 1'-0"
9 | S207 S206



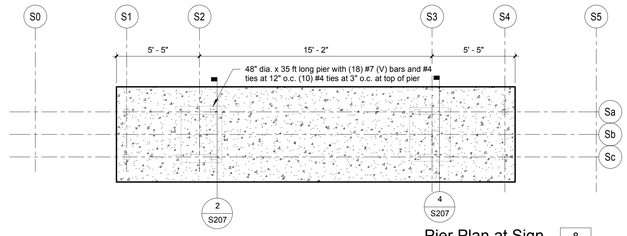
S-U, S-W, S-X
1/4" = 1'-0"
6 | S207 S206



S-X
1/4" = 1'-0"
2 | S207 S206



Fnd Sign
1/4" = 1'-0"
1 | S207 S206



Pier Plan at Sign
1/4" = 1'-0"
8 | S207 S206

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Monument Sign
Framing Plans

Document issued for:
Construction Documents

PROPOSED

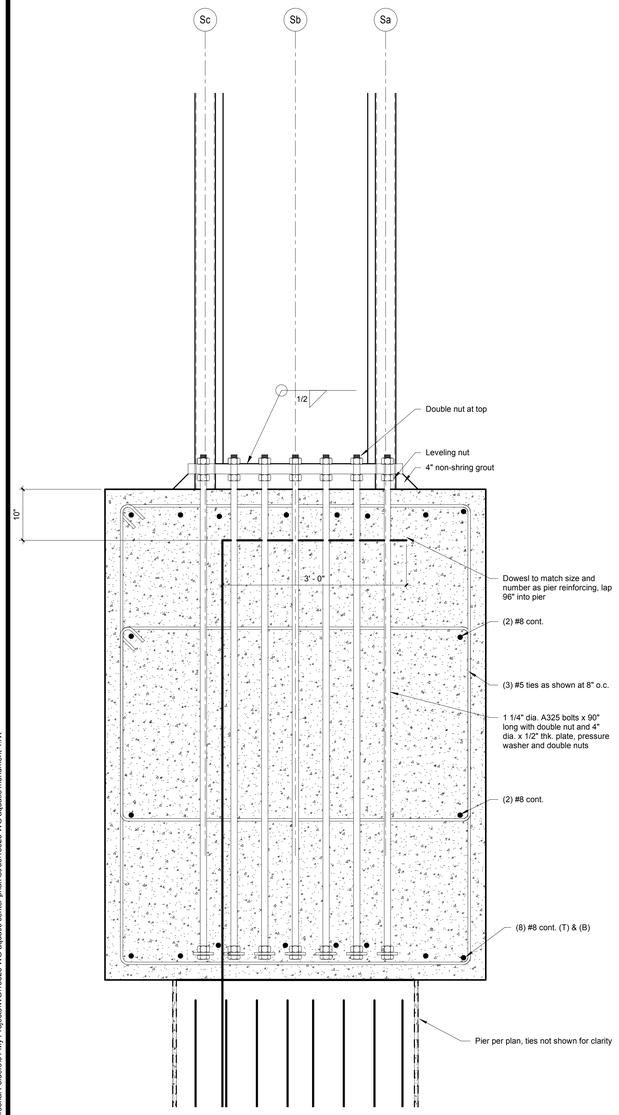
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

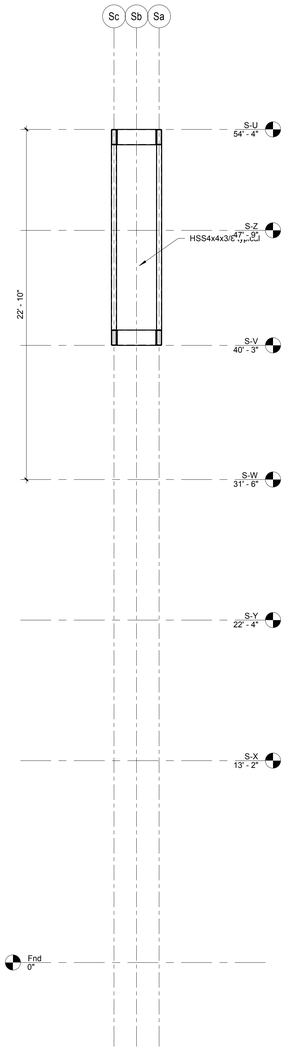
S206

6/11/2019 12:03:48 PM H:\Shawflie\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struc\18323 WG aquatic mounment 4.rvt

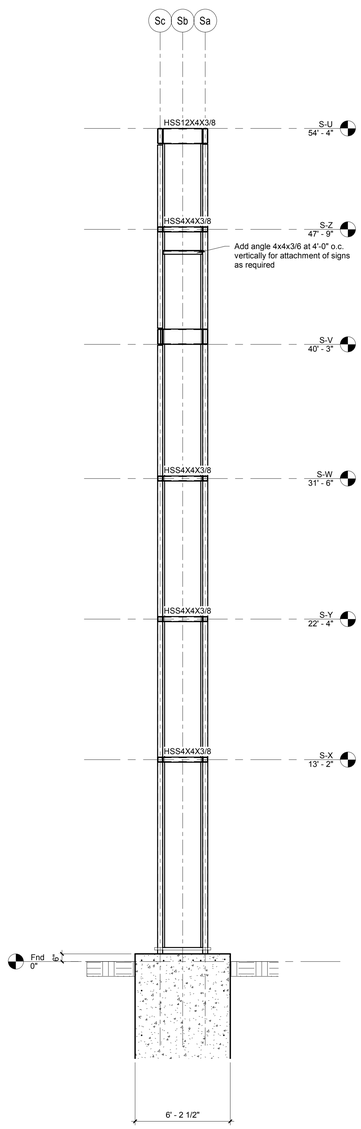
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



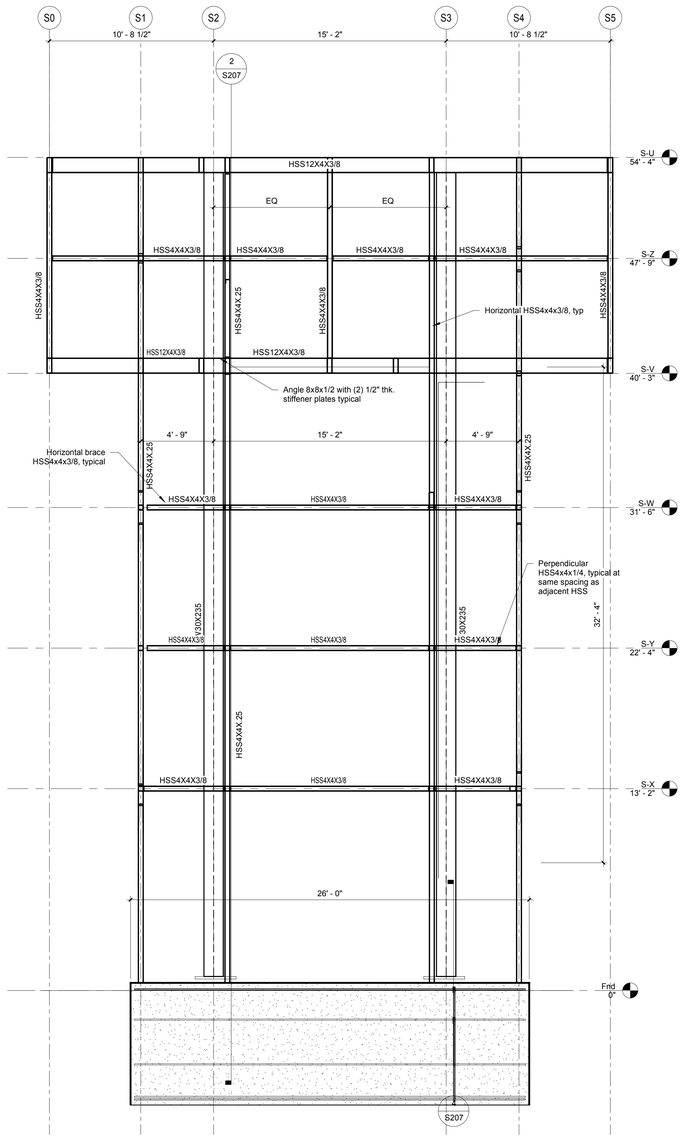
Section 28
1" = 1'-0"
4 S206 S207



Elevation 12 - a
1/4" = 1'-0"
3 S206 S207



Sign Section
1/4" = 1'-0"
2 S206 S207



Sign Front Elevation
1/4" = 1'-0"
1 S206 S207

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION OF THE REGISTERED ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Monument Sign
Sections and Elevations

Document issued for:
Construction Documents

PROPOSED

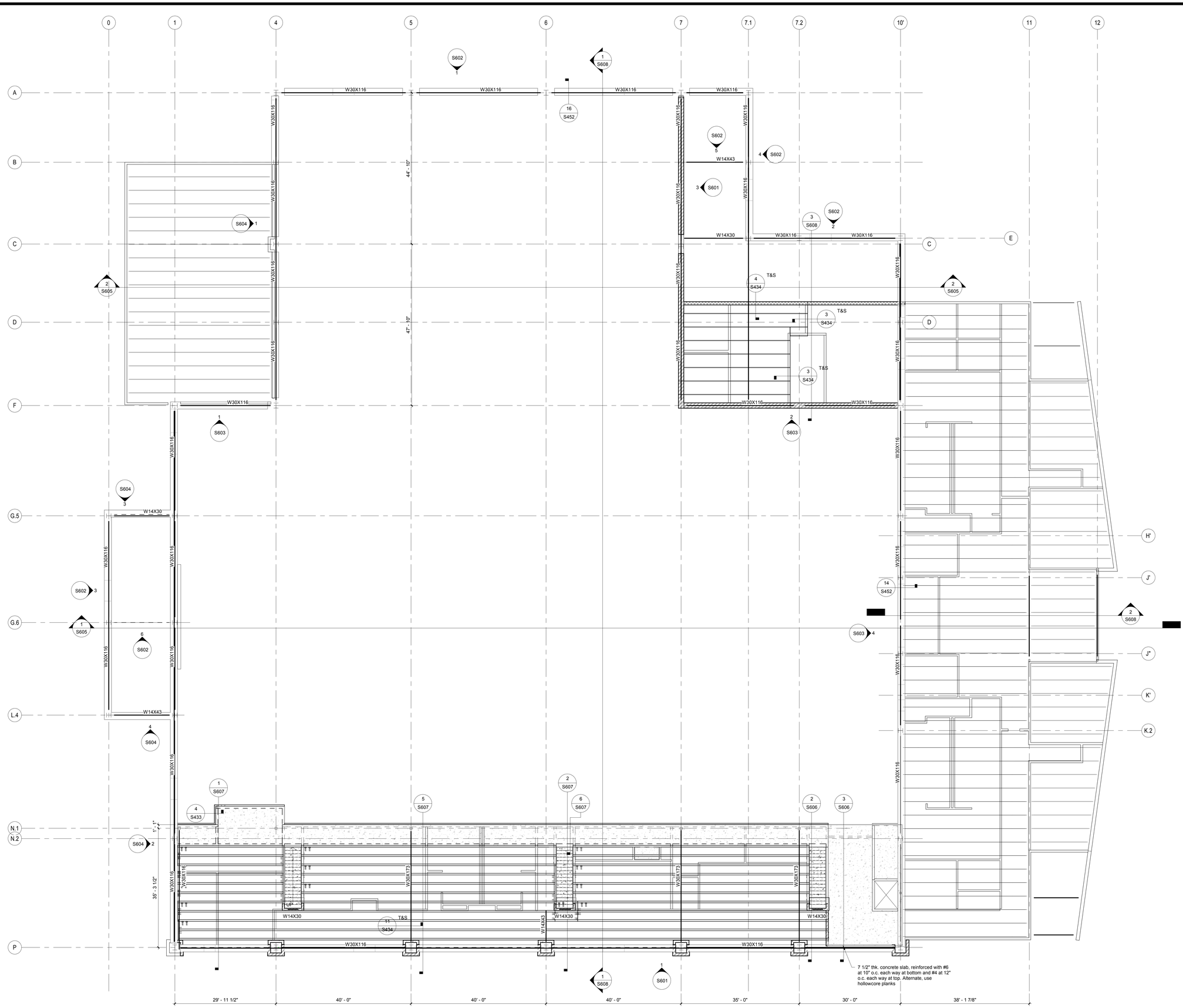
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S207

6/11/2019 12:03:52 PM H:\Share\Personal Folders\01 My Projects\WIP\18323 WG aquatic center pharr\struct\18323 WG aquatic monument 4.rvt

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1515



Bleachers Framing Plan
3/32" = 1'-0"
2
S433 S301

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Beachers and Observation Framing Plans

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S301

6/11/2019 12:01:59 PM H:\Shared\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struc\18323 WG aquatic center_100_CD_06_10_2019.rvt

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1515

Framing Notes

1. FOR GENERAL NOTES SEE SHEET **S101**, **S102**
2. FOR TYPICAL DETAILS SEE **S400** SHEETS.
3. DIMENSIONS SHOWN ARE FOR GENERAL INFORMATION. COORDINATE WITH ARCHITECTURAL PLANS.
4. SEE ARCHITECTURAL ROOF PLAN FOR ROOF HATCHES.
5. SEE MECHANICAL PLANS FOR MECHANICAL OPENINGS.
6. DESIGN trusses UNDER UNITS WITH LOADS INDICATED ON THE DRAWINGS PER DESIGN CRITERIA truss MANUFACTURER TO PROVIDE truss (MAX. DEPTH TO BE AS SHOWN ON PLANS) DESIGN truss FOR L/600. (MECHANICAL WEIGHT+ DEAD LOAD ONLY) COORDINATE OPENINGS WITH MECHANICAL PLANS.
7. Truss MANUFACTURE TO VERIFY THE MINIMUM ROW OF BRIDGING AND BRIDGING SIZE.
8. MAXIMUM JOIST SPACING SHALL BE 24 INCHES ON CENTER.
9. JOISTS UNDER MECHANICAL UNITS MAY BE DOUBLED IF REQUIRED.
10. FOR OPENING IN ROOF AND AT MECHANICAL UNITS, SEE TYPICAL DETAILS.

Roof hatch
1,700 lb
2,600 lb
1,900 lb
2,600 lb

Roof Framing Plan
3/32" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Roof Framing Plan

Document issued for:
Construction Documents

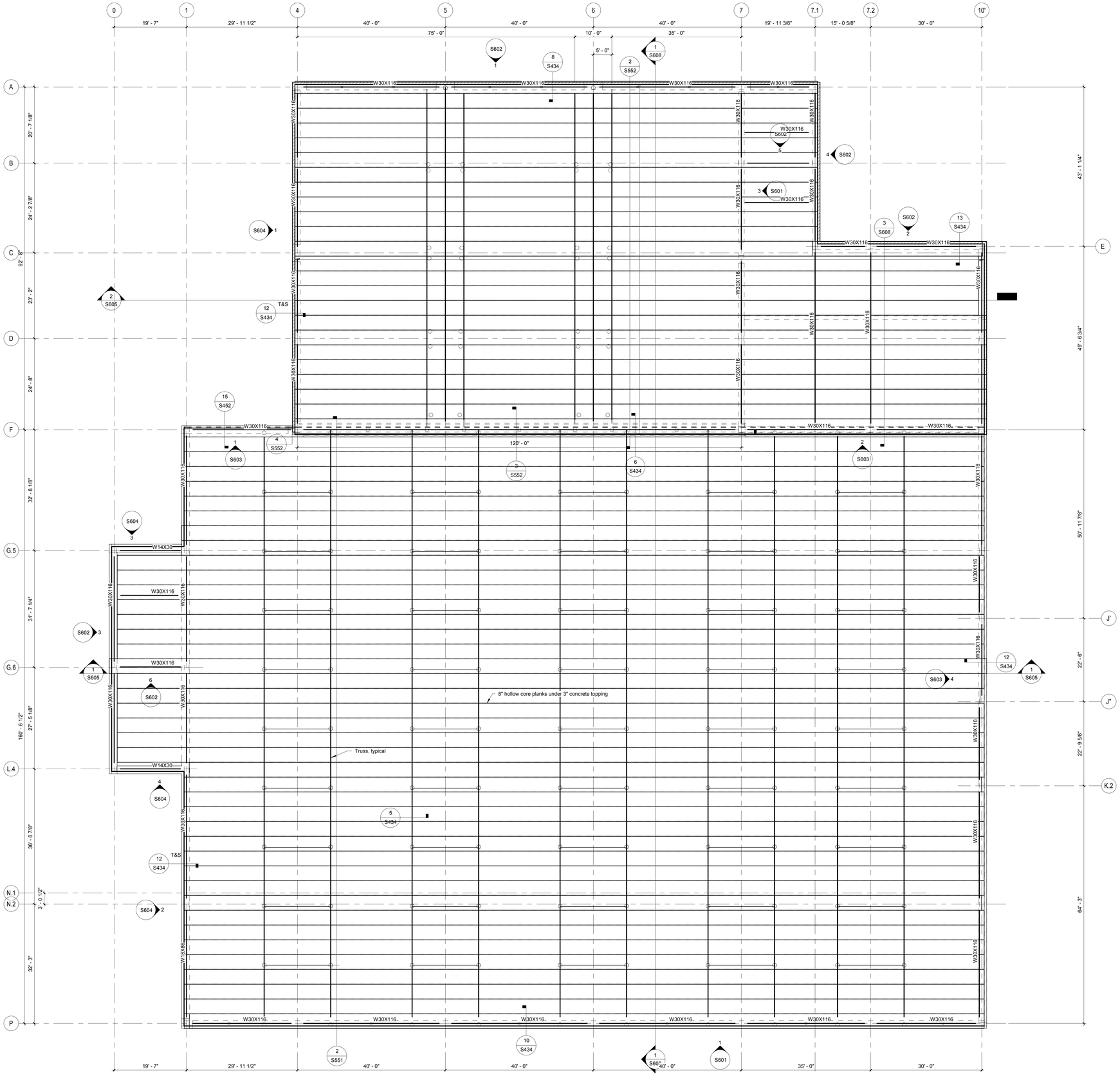
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S302

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



High Roof
3/32" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. ALTERED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE SIGNING ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

High Roof Framing Plan

Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

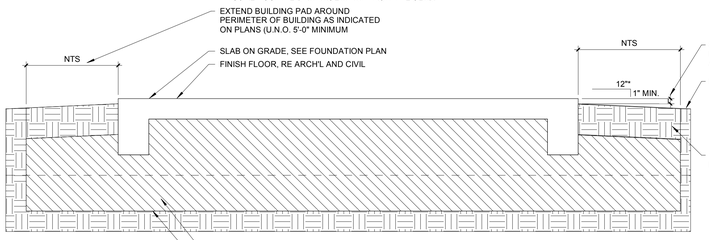
Project: 18323
Date: 6/7/2019

S303

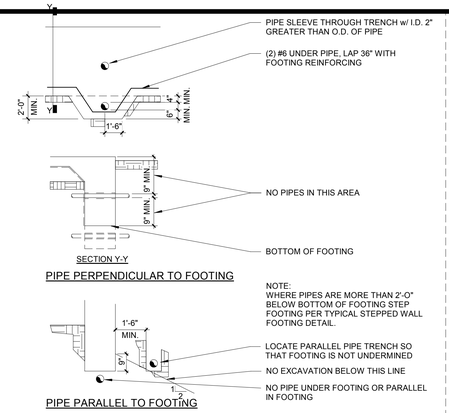
NOTE TO OWNER:
DRAINAGE OF THE SITE MUST BE MAINTAINED THROUGHOUT THE LIFE OF THE STRUCTURE.
THE SOIL AT THIS SITE IS HIGHLY SENSITIVE TO CHANGE IN THE SOIL MOISTURE CONTENT
AND WILL DAMAGE THE STRUCTURE IF THE MOISTURE CONTENT INCREASES OR DECREASES.

* INITIAL ROUGH GRADING SHALL BE COMPLETED w/ NATURAL CLAY MATERIALS (NO SAND ALLOWED)
PRIOR TO FORM SETTING IT SHALL SLOPE 1"/ FOOT FOR THE FIRST 5', AND 6' MIN. IN 10' TO
INSURE POSITIVE DRAINAGE AWAY FROM THE SLAB.

NOTE TO CONTRACTOR
PROVIDE PUMPS ON SITE AND REMOVE ANY WATER FROM THE SITE 100% OF THE TIME. STANDING WATER IN THE EXCAVATION AT ANYTIME, DAY OR NIGHT, IS UNACCEPTABLE.



Typical Building Subgrade Preparation — 9 / S431
1" = 1'-0"

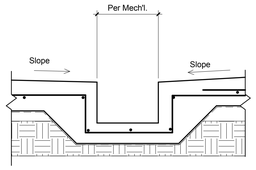


Typical Piping Through Footing — 5 / S431
3/8" = 1'-0"

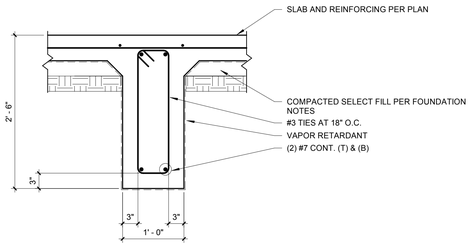
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1616

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

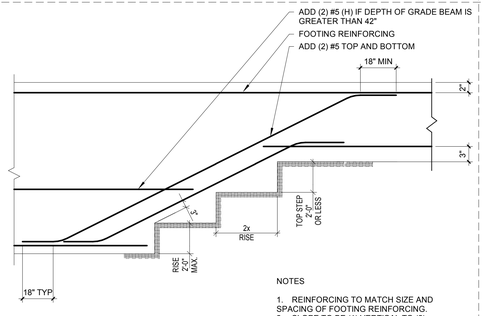
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS PRELIMINARY AND THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.



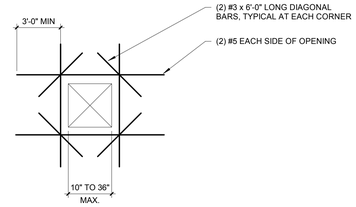
Footing at Exterior Overhead Door 16" — 14 / S431
1" = 1'-0"



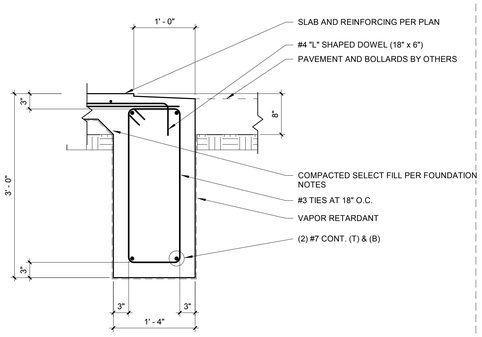
Footing at Interior, 12x30 — 10 / S202 S431
1" = 1'-0"



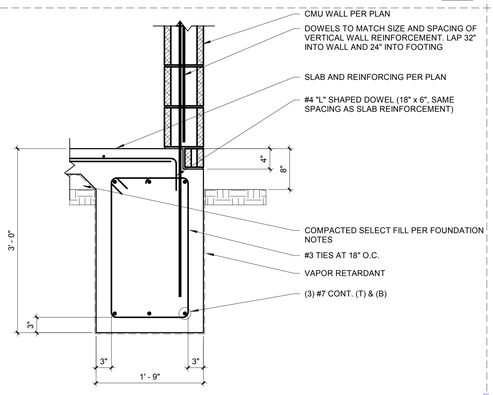
Typical Stepped Footing — 6 / S431
1" = 1'-0"



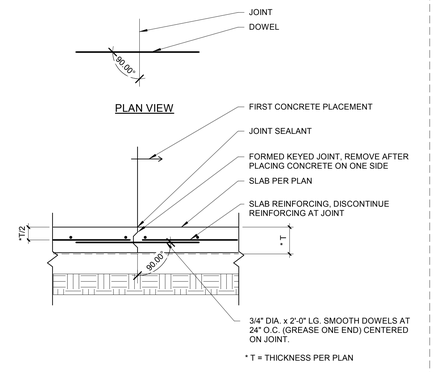
Typical Slab Opening Reinforcing — 2 / S431
1/4" = 1'-0"



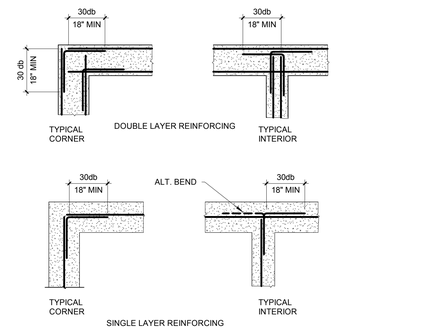
Footing at Exterior Overhead Door 16" — 15 / S431
1" = 1'-0"



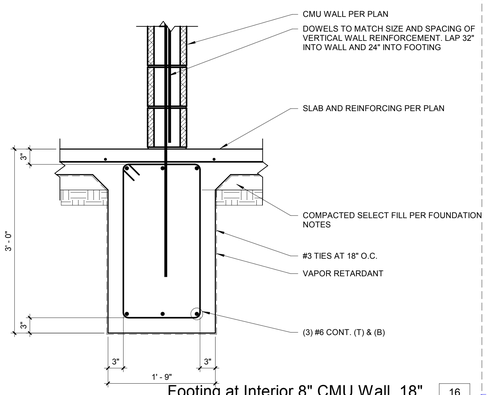
Footing at Exterior CMU Wall w/ Ledge — 11 / S202 S431
1" = 1'-0"



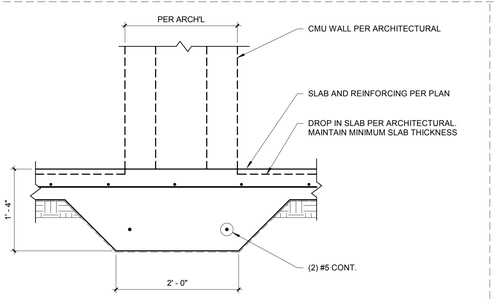
Typical Slab Construction Joint — 7 / S431
1" = 1'-0"



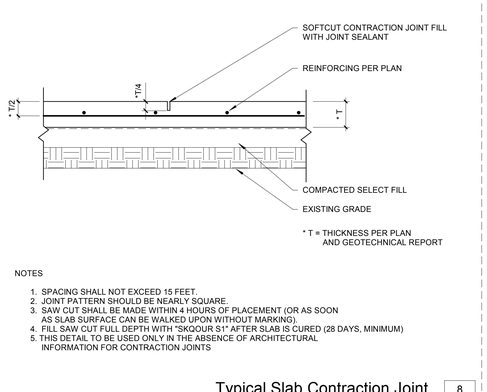
Typical Reinforcing at Concrete Intersections — 3 / S431
1/4" = 1'-0"



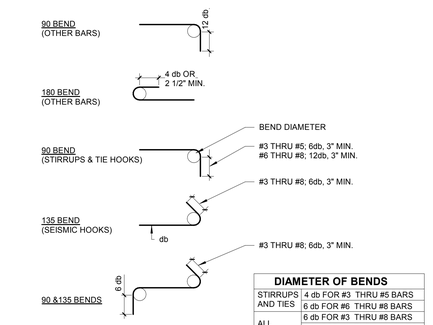
Footing at Interior 8" CMU Wall, 18" — 16 / S202 S431
1" = 1'-0"



Footing at Interior Non Bearing CMU, Plumbing Chase — 12 / S202 S431
1" = 1'-0"



Typical Slab Contraction Joint — 8 / S431
1" = 1'-0"



DIAMETER OF BENDS

STIRRUPS AND TIES	4 db FOR #3 THRU #5 BARS
	6 db FOR #6 THRU #8 BARS
ALL OTHERS	6 db FOR #3 THRU #8 BARS
	8 db FOR #9 THRU #11 BARS
	10 db FOR #14 THRU #18 BARS

Typical Reinforcing Bends — 4 / S431
1/4" = 1'-0"

Revision	Date	Issued by	DESCRIPTION

Typical Concrete Details

Document issued for:
Construction Documents

PROPOSED

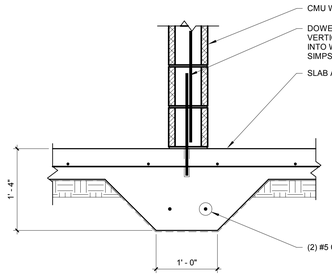
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

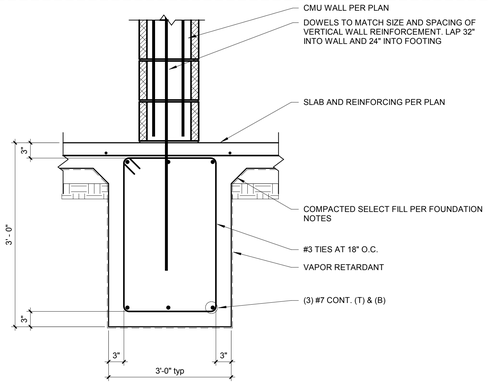
S431

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

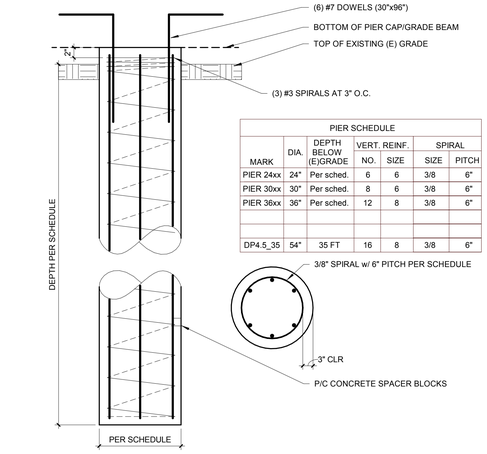


Footing at Interior Non Bearing CMU — 17 (S202, S432)
1" = 1'-0"



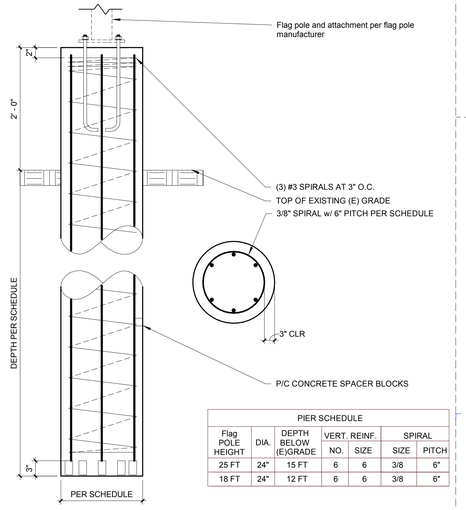
Footing at Interior 12" CMU Wall, 24" — 14 (S202, S432)
1" = 1'-0"

Footing at Interior 8" CMU Wall, 24" — 15 (S202, S432)
1" = 1'-0"



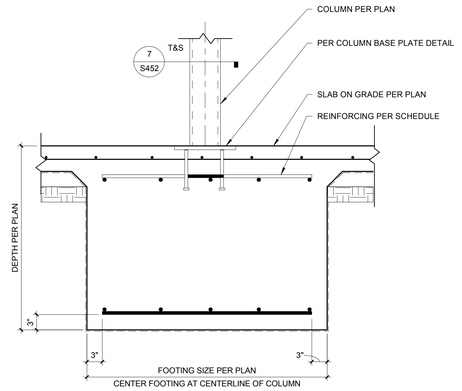
PIER SCHEDULE						
MARK	DIA.	DEPTH BELOW (E)GRADE	VERT. REINF. NO.	VERT. REINF. SIZE	SPIRAL SIZE	SPIRAL PITCH
PIER 24xx	24"	Per sched.	6	6	3/8	6"
PIER 30xx	30"	Per sched.	8	6	3/8	6"
PIER 36xx	36"	Per sched.	12	8	3/8	6"
DP4.5_35	54"	35 FT	16	8	3/8	6"

Pier Schedule — 10 (S432)
1" = 1'-0"

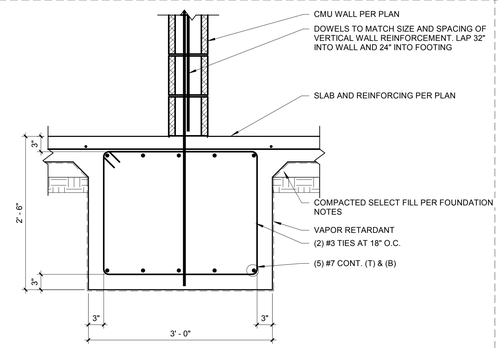


PIER SCHEDULE						
Flag POLE HEIGHT	DIA.	DEPTH BELOW (E)GRADE	VERT. REINF. NO.	VERT. REINF. SIZE	SPIRAL SIZE	SPIRAL PITCH
25 FT	24"	15 FT	6	6	3/8	6"
18 FT	24"	12 FT	6	6	3/8	6"

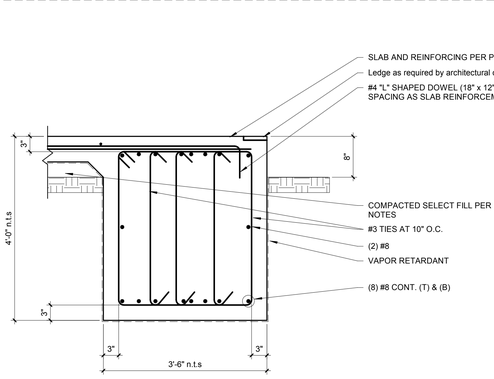
Flag Poles — 6 (S432)
1" = 1'-0"



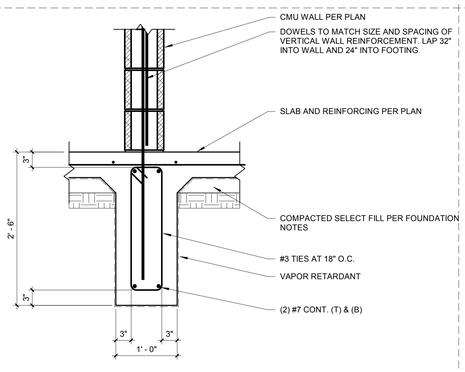
Footing at Interior Steel Column — 2 (S432)
1" = 1'-0"



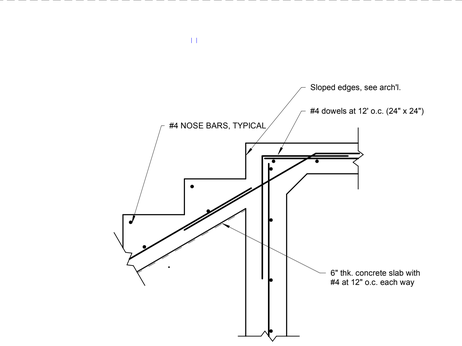
Footing at Interior 8" CMU Wall, 24" — 15 (S202, S432)
1" = 1'-0"



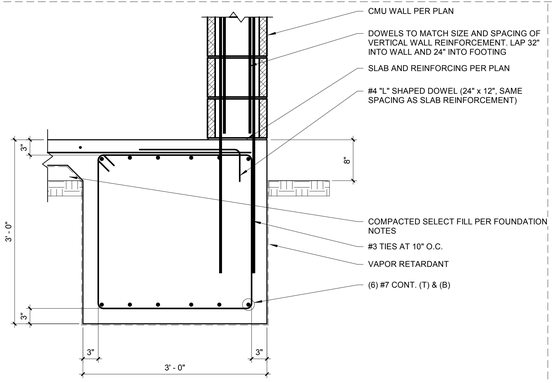
Footing at Exterior, 36x36 — 11 (S202, S432)
1" = 1'-0"



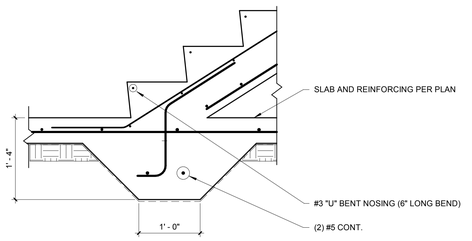
Footing at Interior 8" CMU Wall, 12" — 7 (S432)
1" = 1'-0"



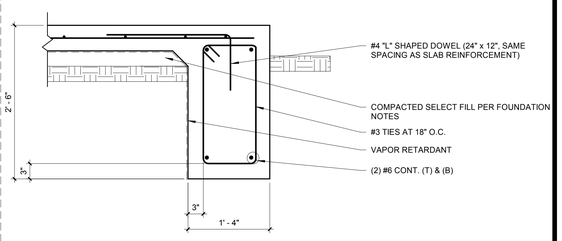
Stairs at Top — 3 (S432)
1" = 1'-0"



Footing at Exterior, CMU 12" — 12 (S202, S432)
1" = 1'-0"



Footing at Concrete Stairs — 8 (S202, S432)
1" = 1'-0"



Footing at Exterior — 4 (S432)
1" = 1'-0"

Revision	Date	Issued by	DESCRIPTION

Foundation Details

Document issued for:
Construction Documents

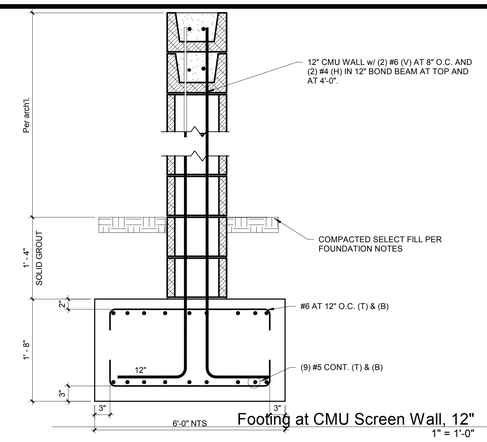
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

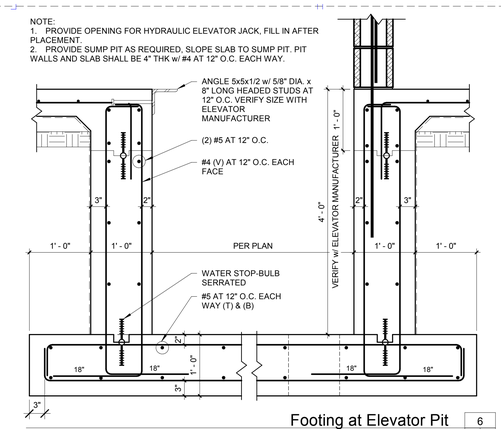
S432

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

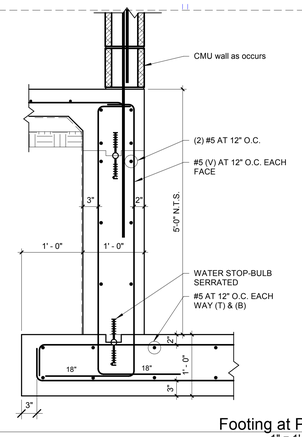


Footing at CMU Screen Wall, 12"
1" = 1'-0"
5 | S202 | S433

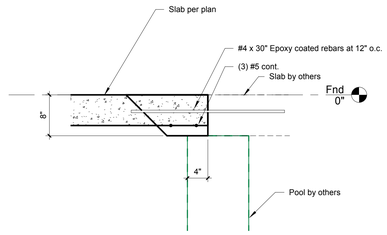
NOTE:
1. PROVIDE OPENING FOR HYDRAULIC ELEVATOR JACK, FILL IN AFTER PLACEMENT.
2. PROVIDE SUMP PIT AS REQUIRED, SLOPE SLAB TO SUMP PIT. PIT WALLS AND SLAB SHALL BE 4" THK w/ #4 AT 12" O.C. EACH WAY.



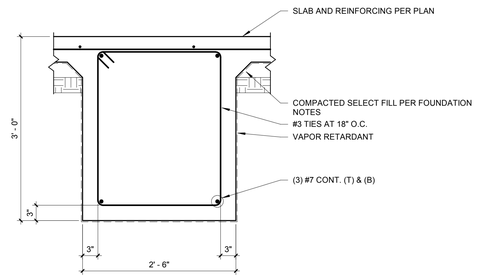
Footing at Elevator Pit
1" = 1'-0"
6 | S202 | S433



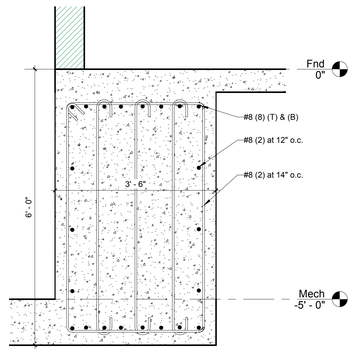
Footing at Pit
1" = 1'-0"
2 | S202 | S433



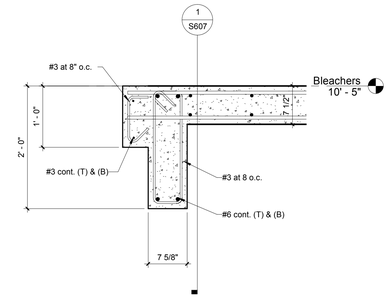
Slab on Grade to Pool Wall at Equipment Room
1" = 1'-0"
7 | S202 | S433



Footing at Interior, 30x36
1" = 1'-0"
3 | S202 | S433



Grade Beam at Pit
3/4" = 1'-0"
8 | S205 | S433



Concrete Beam
1" = 1'-0"
4 | S301 | S433

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Foundation Details

Document issued for:
Construction Documents

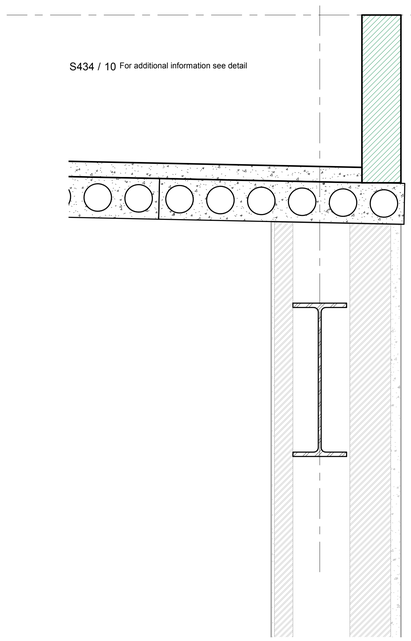
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

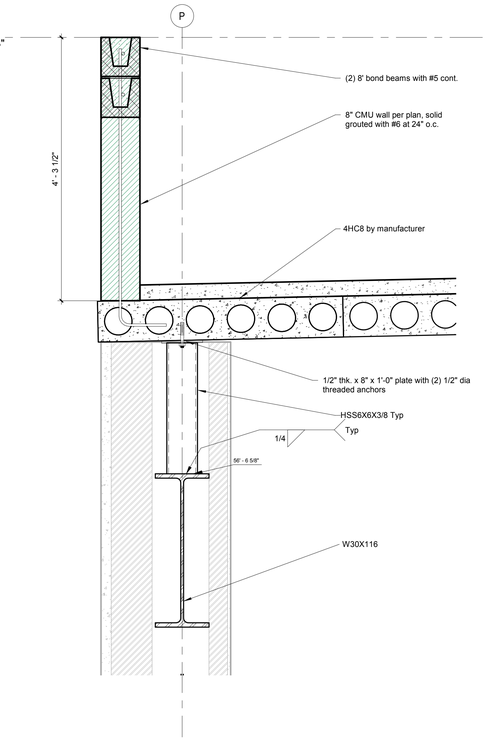
Project: 18323
Date: 6/7/2019

S433

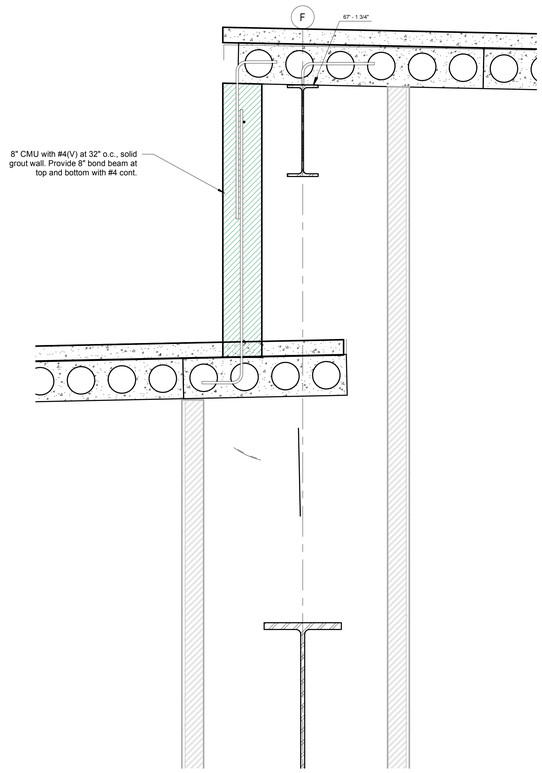
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



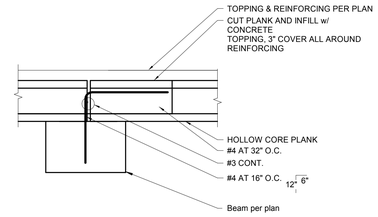
Hollowcore to Steel Beam, Parallel, Low Side 13
1" = 1'-0" S303 S434



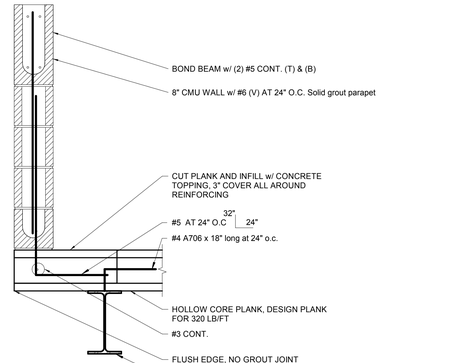
Hollowcore to Steel Beam 10
1" = 1'-0" S303 S434



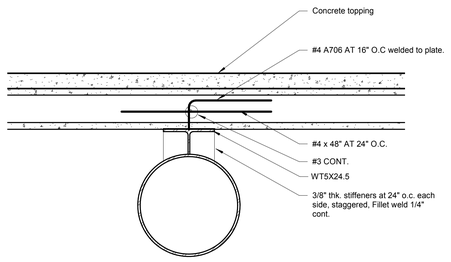
Detail at Roof Drop 6
1" = 1'-0" S303 S434



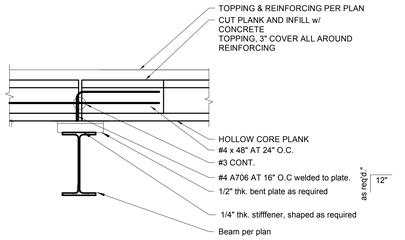
Typical Hollow Core Plank 1
1" = 1'-0" S434



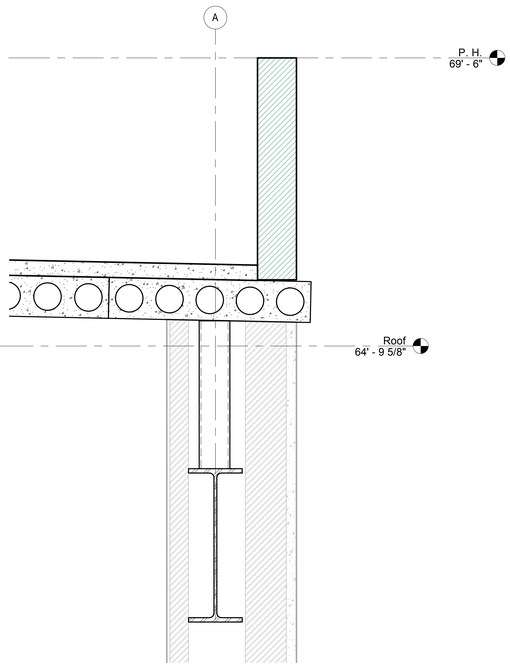
Typical Hollow Core Plank 2
1" = 1'-0" S434

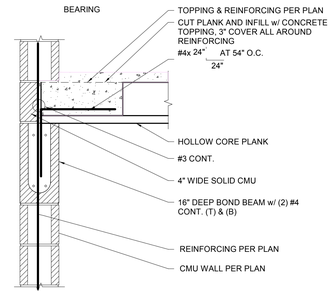


Hollowcore to Truss 5
1" = 1'-0" S303 S434

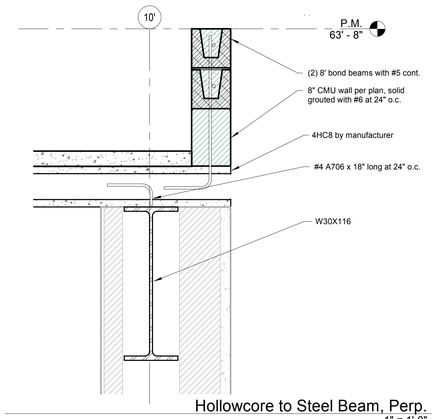


Typical Hollow Core Plank 11
1" = 1'-0" S301 S434



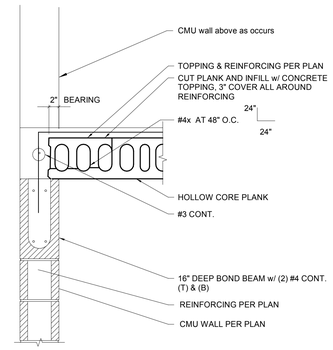


Typical Hollow Core Plank 3
1" = 1'-0" S301 S434



Hollowcore to Steel Beam, Perp. 12
1" = 1'-0" S303 S434

Hollowcore to Steel Beam, Parallel, Low 8
1" = 1'-0" S303 S434



Typical Hollow Core Plank 4
1" = 1'-0" S301 S434

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Hollow Core Planks Details

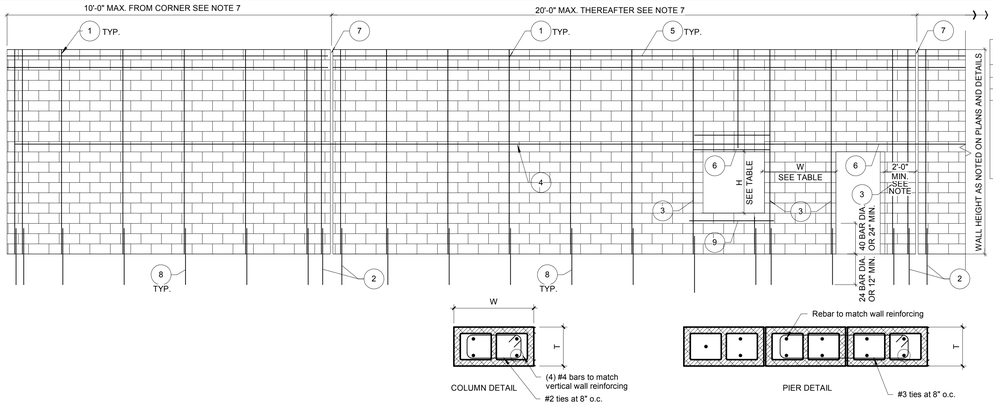
Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S434



WALL THICKNESS (T)	DIMENSIONAL LIMITS		
	CLEAR	PIER	COLUMN
6"	H > 24" AND W > 32"	H > 24" AND 32" > W > 24"	H > 24" AND W < 24"
8"	H > 32" AND W > 40"	H > 32" AND 40" > W > 24"	H > 32" AND W < 24"
12"	H > 48" AND W > 64"	H > 48" AND 64" > W > 40"	H > 48" AND W < 40"

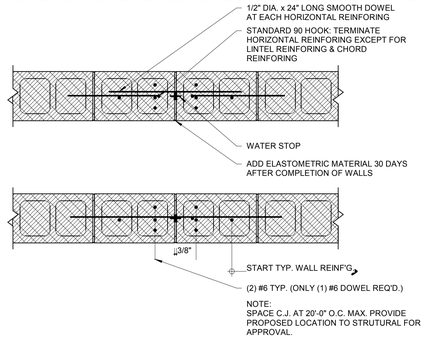
1. NORMAL WALL REINFORCING AS NOTED ON DETAILS AND DESCRIBED IN GENERAL NOTES.
2. ADDITIONAL VERTICAL REINFORCING AT CONTROL JOINTS - SEE TYPICAL CONTROL JOINT DETAIL.
3. ADDITIONAL VERTICAL REINFORCING AT JAMBS OF ALL WALL OPENINGS.
4. INTERMEDIATE BOND BEAM REINFORCED AND SPACED AS REQUIRED ON DRAWINGS. CUT ONE INTERMEDIATE BOND BEAM SHALL BE PLACED AT WINDOW LINTEL ELEVATION AND AT 8'-0" O.C.
5. ROOF LEVEL BOND BEAM REINFORCED AS NOTED ON DETAILS - CONTINUE ALL REINFORCING UNCUT THROUGH CONTROL JOINTS.
6. LINTEL REINFORCING AS DETAILED AND/OR SCHEDULED.
7. CONTROL JOINTS (CJ): UNLESS NOTED OTHERWISE ON THE ARCHITECTURAL DRAWINGS, THE CJ SPACING NOTED IS THE MAXIMUM PERMITTED. THE SPACING OF CJ'S SHALL BE COORDINATED WITH THE WALL OPENING LOCATIONS AND IN NO CASE SHALL A CJ BE LOCATED CLOSER THAN 24" TO THE JAMB OF ANY WALL OPENING.
8. FOUNDATION DOWELS TO MATCH VERTICAL WALL REINFORCING SIZE AND SPACING.
9. SILL LEVEL BOND BEAM REINFORCED AS NOTED IN MASONRY GENERAL NOTES.

Typical CMU Wall Elevation
1" = 1'-0" — 5 / S441

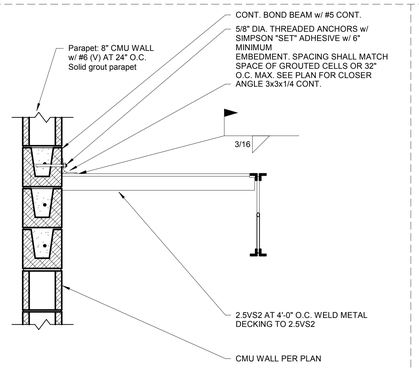
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER AUTHORIZATION SHALL NOT BE USED BY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

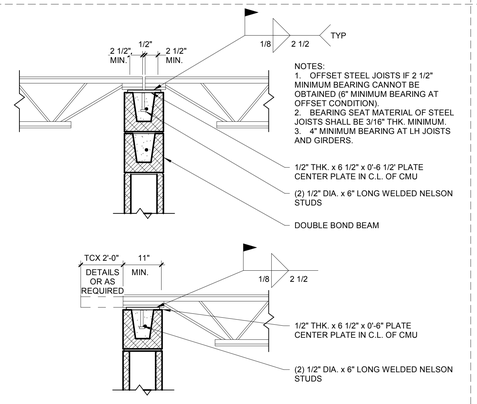


Typical CMU Control Joint
1" = 1'-0" — 14 / S441

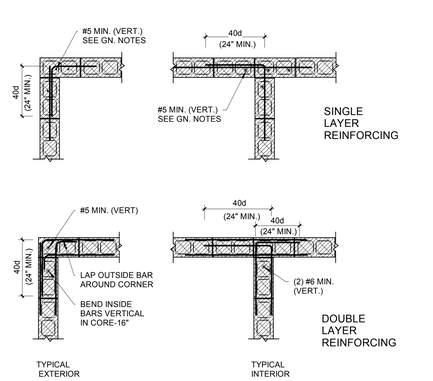


SEE DETAIL 6/S404 FOR ADDITIONAL INFORMATION

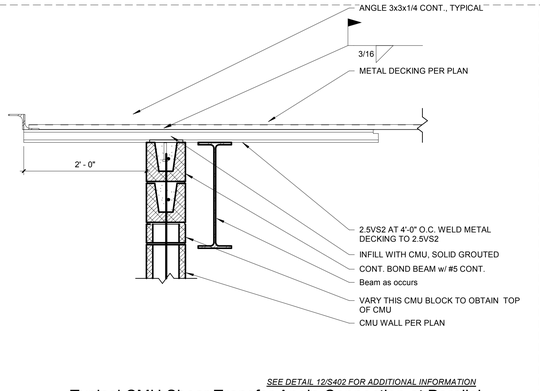
Typ. CMU Shear Transfer Angle Conn. at Parallel Joist
1" = 1'-0" — 10 / S302 S441



Typical CMU Steel Joist Bearing
1" = 1'-0" — 6 / S302 S441

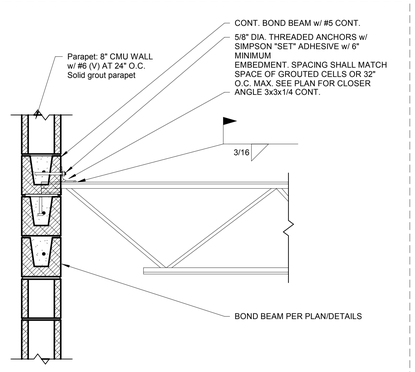


Typical CMU Reinforcing at Intersections
1/2" = 1'-0" — 2 / S441



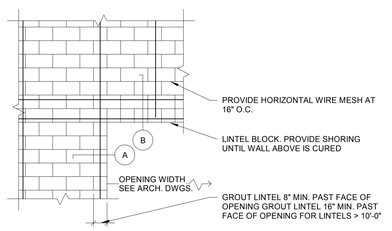
SEE DETAIL 12/S402 FOR ADDITIONAL INFORMATION

Typical CMU Shear Transfer Angle Connection at Parallel Joist at Exterior
1" = 1'-0" — 15 / S441



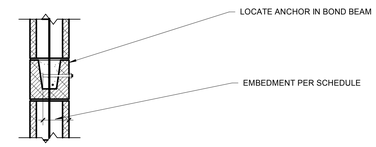
Typical CMU Shear Transfer Angle Connection
1" = 1'-0" — 11 / S302 S441

LINTEL SCHEDULE					
CLEAR SPAN	WIDTH	DEPTH	REINFORCING	#3 TIES AT:	REMARKS
<3'-4"	8"	8"	(1) #5		
<6'-6"	8"	16"	(1) #5 (T) & (B)	8"	
<10'-0"	8"	16"	(1) #6 (T) & (B)	8"	
<12'-0"	8"	24"	(1) #7 (T) & (B)	8"	
<14'-8"	8"	36"	(1) #7 (T) & (B)	8"	
<16'-0"	8"	24"	(2) #5 (T) & (B)	8"	C.I.P. CONC.
<3'-4"	12"	8"	(2) #5		
<6'-6"	12"	16"	(2) #5 (T) & (B)	8"	
<10'-0"	12"	16"	(2) #6 (T) & (B)	8"	
<12'-0"	12"	24"	(2) #7 (T) & (B)	8"	
<14'-8"	12"	36"	(2) #7 (T) & (B)	8"	
<16'-0"	12"	24"	(2) #6 (T) & (B)	8"	C.I.P. CONC.

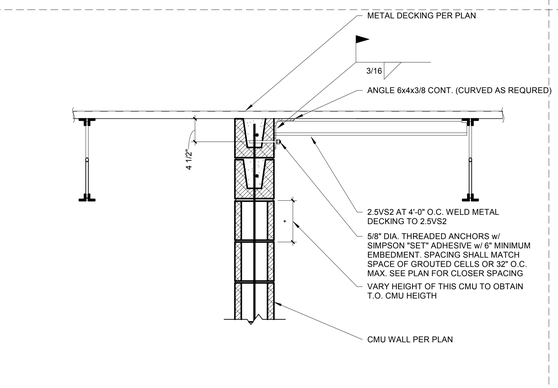


Typical CMU Lintel
1" = 1'-0" — 8 / S441

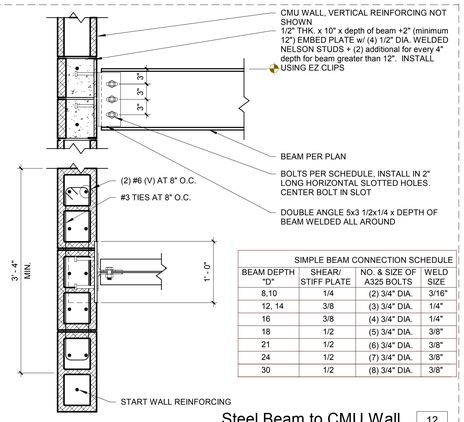
DIA.	EMBEDMENT		ADHESIVE
	CONCRETE	MASONRY	
1/2"	4"	6"	SIMPSON SET or HILTI HY150
5/8"	5"	6"	SIMPSON SET
3/4"	6"	6"	SIMPSON SET



Typical CMU Threaded Anchor Embedment
1" = 1'-0" — 3 / S441

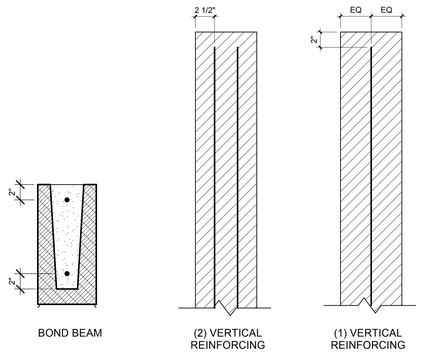


Typical CMU Shear Transfer Angle Connection at Parallel Joists
1" = 1'-0" — 7 / S441



SIMPLE BEAM CONNECTION SCHEDULE			
BEAM DEPTH "D"	SHEAR/ STIFF PLATE	NO. & SIZE OF A325 BOLTS	WELD SIZE
8,10	1/4	(2) 3/4" DIA.	3/16"
12, 14	3/8	(3) 3/4" DIA.	1/4"
16	3/8	(4) 3/4" DIA.	1/4"
18	1/2	(5) 3/4" DIA.	3/8"
21	1/2	(6) 3/4" DIA.	3/8"
24	1/2	(7) 3/4" DIA.	3/8"
30	1/2	(8) 3/4" DIA.	3/8"

Steel Beam to CMU Wall
1" = 1'-0" — 12 / S441



Typical CMU Reinforcing Clearances
1 1/2" = 1'-0" — 4 / S441

Revision	Issued by	Date	DESCRIPTION

Typical CMU Details

Document issued for:
Construction Documents

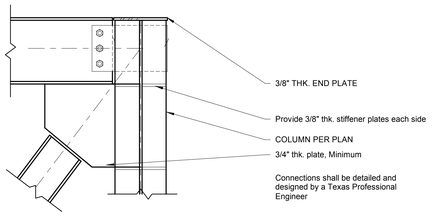
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

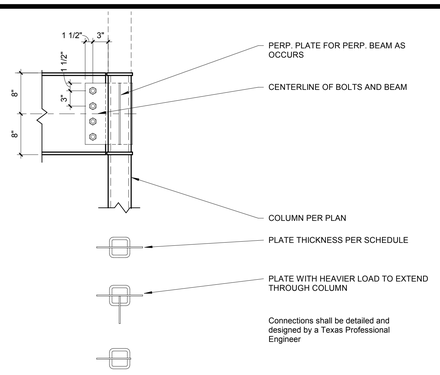
Project: 18323
Date: 6/7/2019

S441

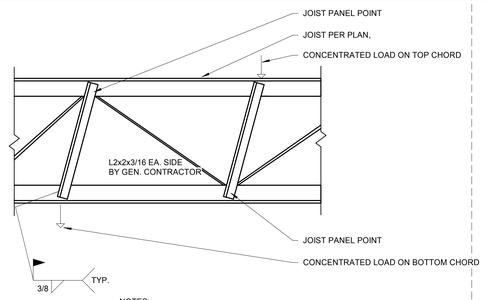
6/11/2019 12:02:08 PM H:\Shardle\Personal Folders\01 My Projects\WCG\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt



Typical Steel WF Brace to WF Flange Copy 1
1" = 1'-0" — 13 / S452



Steel Beam to Steel Column, Moment Connection
1" = 1'-0" — 9 / S452



NOTES:
THIS DETAIL IS APPLIED FOR ALL CONCENTRATED LOADS THAT ARE ATTACHED TO JOIST(S) BUT NOT SHOWN ON THE STRUCTURAL DRAWINGS. EXAMPLES OF THESE LOADS ARE:

1. HANGING LOAD, PARTITION THAT EXCEEDS 150 lb.
2. HANGING PLUMBING, MECH'L STEEL PIPE WITH DIA. > 5"
3. HANGING BASKETBALL GOALS
4. MECHANICAL UNITS.

Typical Steel Joist Bracing Reinforcement
1" = 1'-0" — 5 / S452

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1515

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
9 5 6 . 9 9 4 . 1 9 0 0
t w g a r c h . c o m

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Steel Framing Details

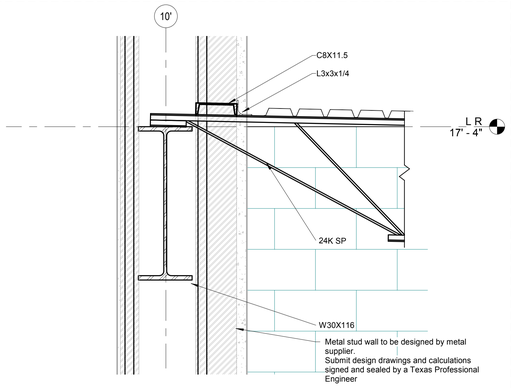
Document issued for:
Construction Documents

PROPOSED

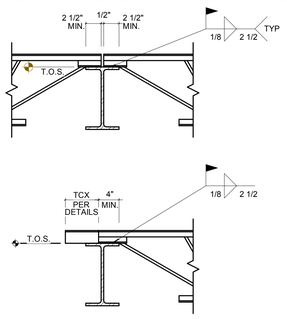
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S452



Steel Joists to Steel Beam at Low Building
1" = 1'-0" — 14 / S301 S452

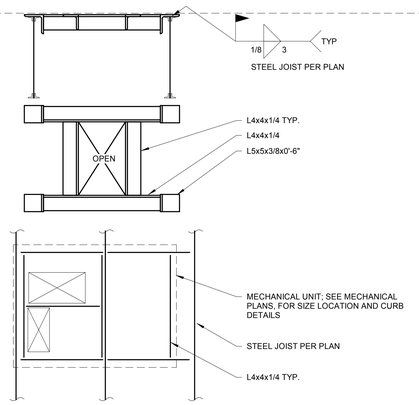


NOTES:
1. OFFSET STEEL JOISTS IF 2 1/2" MINIMUM BEARING CANNOT BE OBTAINED (6" MINIMUM BEARING AT OFFSET CONDITION)

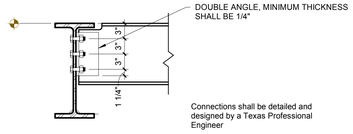
2. BEARING SEAT MATERIAL OF STEEL JOISTS SHALL BE 3/16" THK. MINIMUM

3. AT BRIDGING, AS REQUIRED BY JOIST MANUFACTURER, ATTACH TO WALL w/ ANGLE 3x3x1/4 x DEPTH OF JOIST + 4", ATTACH w/ (3) 5/8" DIA. THREADED ANCHORS

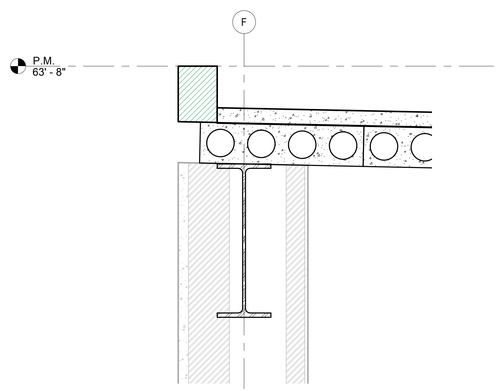
Steel Joist to Steel Beam
1" = 1'-0" — 10 / S302 S452



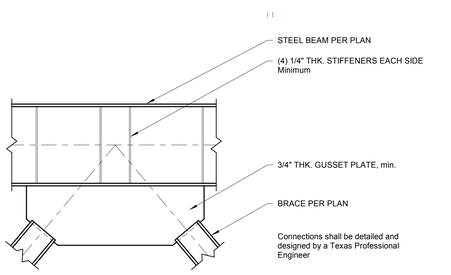
Typical Steel Joist Reinforcement at Openings
1" = 1'-0" — 6 / S452



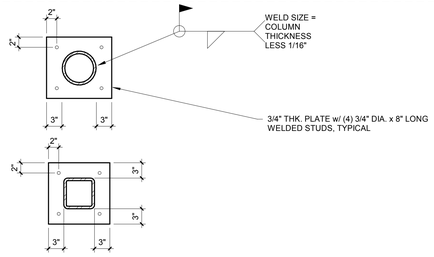
Typical Steel Beam to Steel Beam, Double Angle
1" = 1'-0" — 2 / S452



Detail 56
1" = 1'-0" — 15 / S303 S452

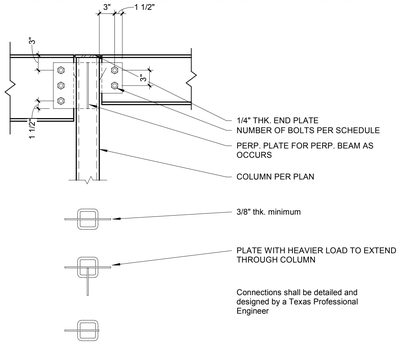


Typical Steel WF Brace to WF Beam
1" = 1'-0" — 11 / S452

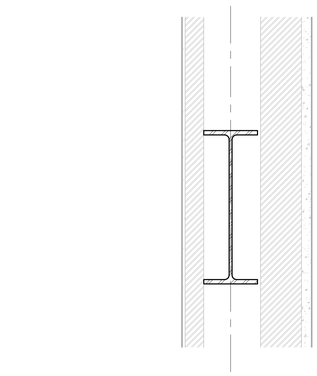


NOTES:
1. DIMENSIONS ARE FROM FACE OF PLATE TO FACE OF COLUMN
2 DIMENSIONS FOR WELDED STUDS ARE FROM FACE OF PLATE TO CENTERLINE OF STUD

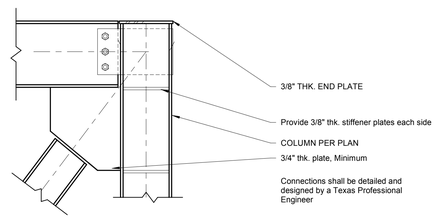
Steel Column Base Plate
1" = 1'-0" — 7 / S432 S452



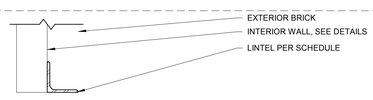
Typical Steel Beam to Steel Column
1" = 1'-0" — 3 / S452



Typical HSS over WF
1" = 1'-0" — 16 / S301 S452



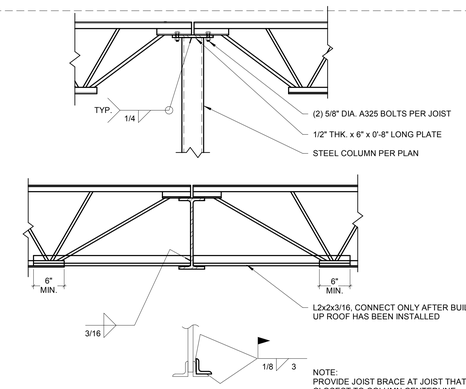
Typical Steel WF Brace to WF Flange
1" = 1'-0" — 12 / S452



LOOSE ANGLE LINTEL SCHEDULE			
ANGLE SIZE (LLV)	CLEAR OPENING		REMARKS
	GREATER THAN	UP TO	
4" x 4" x 5/16"	---	3'-0"	8" MIN. BEARING EA. END
4" x 4" x 3/8"	3'-1"	6'-0"	12" MIN. BEARING EA. END
5" x 3-1/2" x 3/8"	6'-1"	8'-0"	12" MIN. BEARING EA. END
6" x 4" x 3/8"	8'-1"	9'-0"	16" MIN. BEARING EA. END
6" x 4" x 1/2"	9'-1"	10'-0"	16" MIN. BEARING EA. END
7" x 4" x 1/2"	10'-1"	11'-0"	16" MIN. BEARING EA. END
8" x 4" x 1/2"	11'-1"	12'-0"	16" MIN. BEARING EA. END

NOTES:
1. SEE ARCHITECTURAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS.
2. PROVIDE 1" OF BEARING AT EACH JAMB FOR EACH FOOT OF CLEAR SPAN BUT NOT LESS THAN 6".
3. WHERE MINIMUM BEARING CANNOT BE ACHIEVED, PROVIDE ADEQUATE CONNECTION TO ADJACENT STRUCTURAL MEMBERS OR PROVIDE SEPARATE VERTICAL SUPPORTS. SUBMIT SUCH DETAILS FOR THE ENGINEER'S REVIEW.
4. ALL LINTELS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
5. FOR MASONRY OPENINGS GREATER THAN 10'-0", SEE DETAILS ON THE DRAWINGS OR REFER TO ENGINEER.
6. BRICK HEIGHTS OVER OPENINGS GREATER THAN ONE HALF THE LINTEL SPAN SHALL BE SHORED UNTIL MORTAR HAS SET AND CURED.
7. CUT HORIZONTAL LEG 1/4" FROM OUTSIDE FACE OF VENEER.

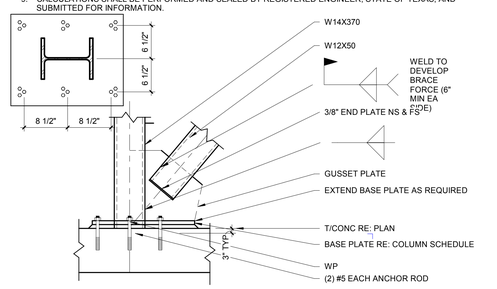
Steel Loose Angle Lintel Schedule
1" = 1'-0" — 8 / S452



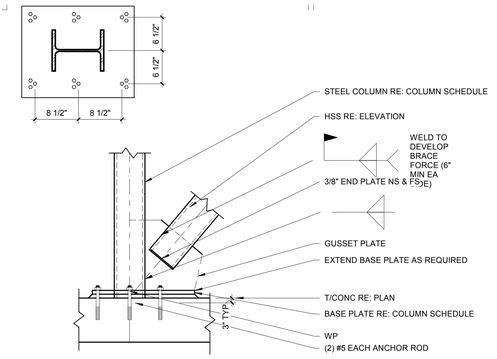
Typical Steel Joist Brace Near and at Column
1" = 1'-0" — 4 / S452

BRACED FRAME DESIGN NOTES:

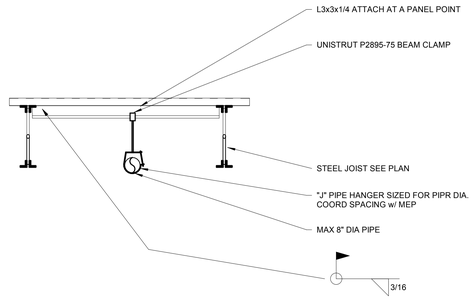
1. DESIGN CONNECTIONS FOR SERVICE LOAD FORCES SHOWN ON BRACED FRAME ELECATIONS
2. SIZE WELDS AND BOLTED CONNECTIONS FOR SHEAR, TENSION, AND ECCENTRICITY OF CENTER OF GRAVITY OF WELD/BOLTS AND CENTER OF GRAVITY OF FORCE.
3. DESIGN CONNECTIONS TO COLUMNS FOR COMBINED GRAVITY LOAD AND VERTICAL COMPONENT OF LATERAL LOAD.
4. REFERENCE PLANS AND GENERAL NOTES FOR REQUIRED GRAVITY FORCES.
5. REFERENCE PLANS FOR HORIZONTAL FORCES REQUIRED TO BE TRANSFERED THROUGH COLUMN CONNECTIONS. NOTED ON PLANS AS H=XX
6. CHECK NET TENSILE AND SHEAR CAPACITY OF GUSSET PLATES
7. PROVIDE 3/8" GUSSET PLATES MINIMUM
8. PROVIDE WELDED SPACER PLATES EQUAL TO GUSSET PLATE THICKNESSES BETWEEN DOUBLE ANGLE BRACES AT THIRD POINTS ALONG ANGLE LENGTH.
9. CALCULATIONS SHALL BE PERFORMED AND SEALED BY REGISTERED ENGINEER, STATE OF TEXAS, AND SUBMITTED FOR INFORMATION.



Crossbrace Connection Detail 11 / S453
1" = 1'-0"

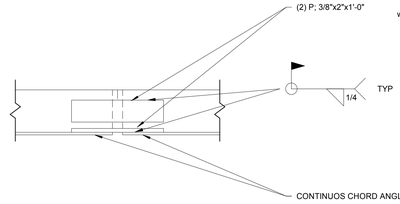


Crossbrace Connection Detail B1 12 / S453
1" = 1'-0"

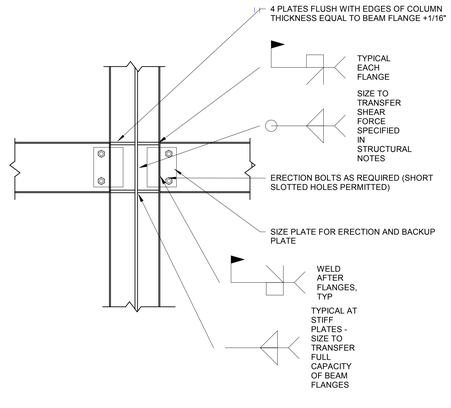


TYP Pipe Hanger Up To 8" DIA (200# MAX) 9 / S453
1" = 1'-0"

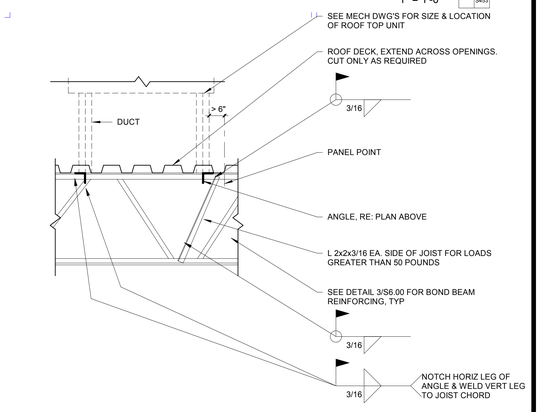
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



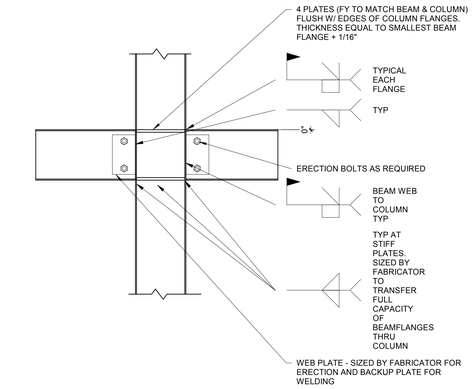
Slice Detail 10 / S453
1" = 1'-0"



Typical Girder To Column Web Moment Connection Detail 5 / S453
1" = 1'-0"



TYP ADD'L RTU Framing Detail 7 / S453
1" = 1'-0"



TYP Girder To Column Flange Moment Connection Detail 8 / S453
1" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS PROHIBITED. ANY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Typical Details

Document issued for:
Construction Documents

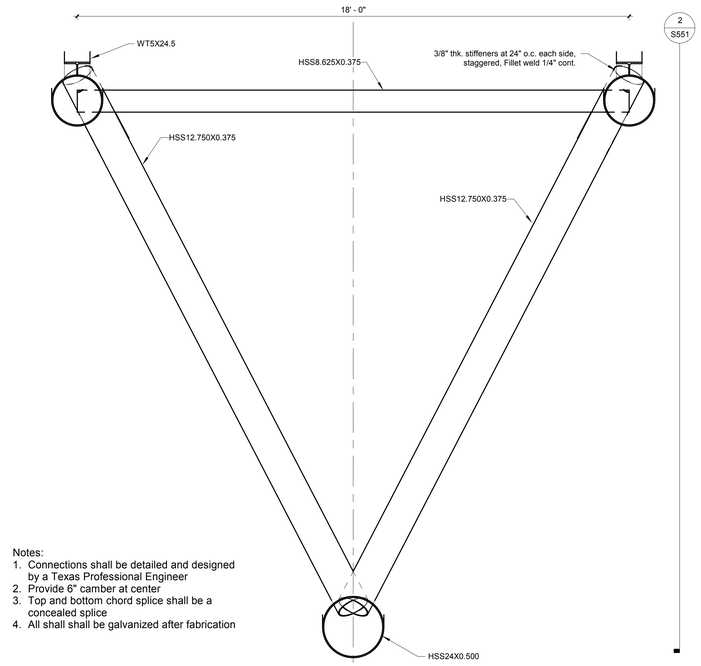
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

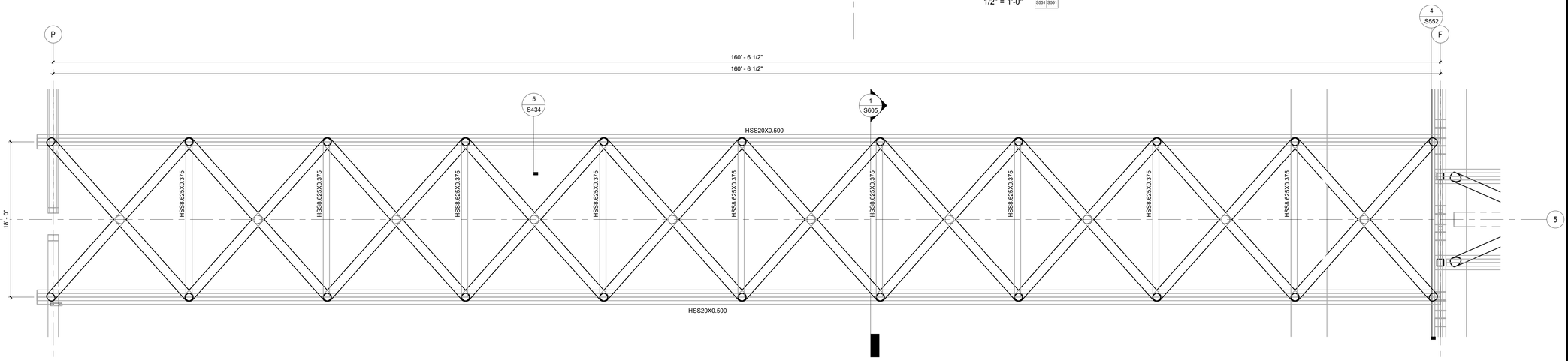
S453

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

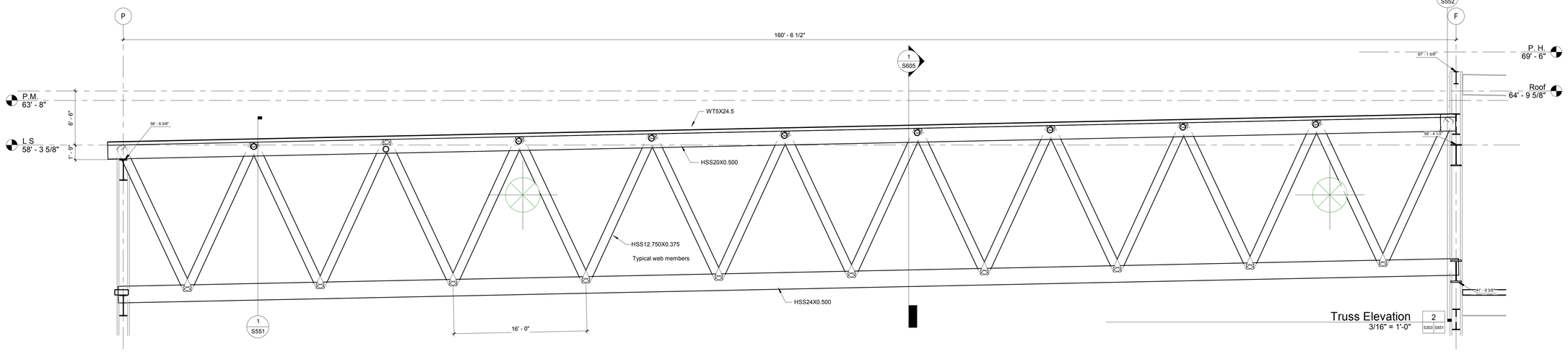


Notes:
1. Connections shall be detailed and designed by a Texas Professional Engineer
2. Provide 6" camber at center
3. Top and bottom chord splice shall be a concealed splice
4. All shall shall be galvanized after fabrication

Truss Section
1/2" = 1'-0"
1 | S551 S551



Main Truss Plan
3/16" = 1'-0"
3 | mech layout S551



Truss Elevation
3/16" = 1'-0"
2 | S303 S551

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS PROHIBITED. ANY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Truss Details

Document issued for:
Construction Documents

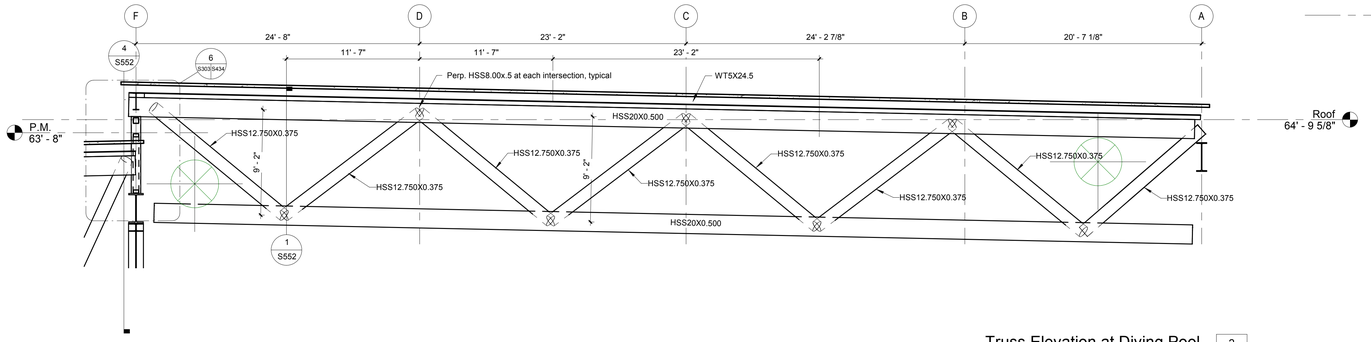
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

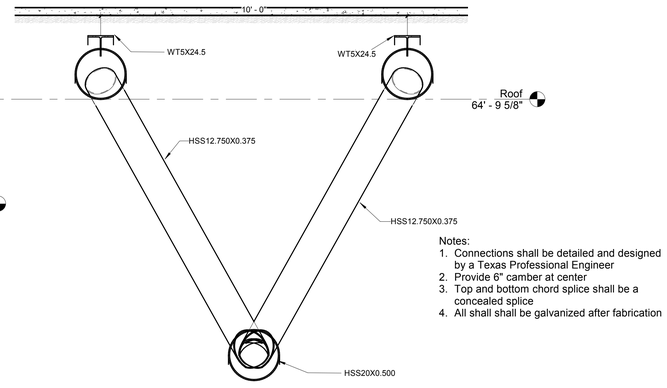
Project: 18323
Date: 6/7/2019

S551

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615

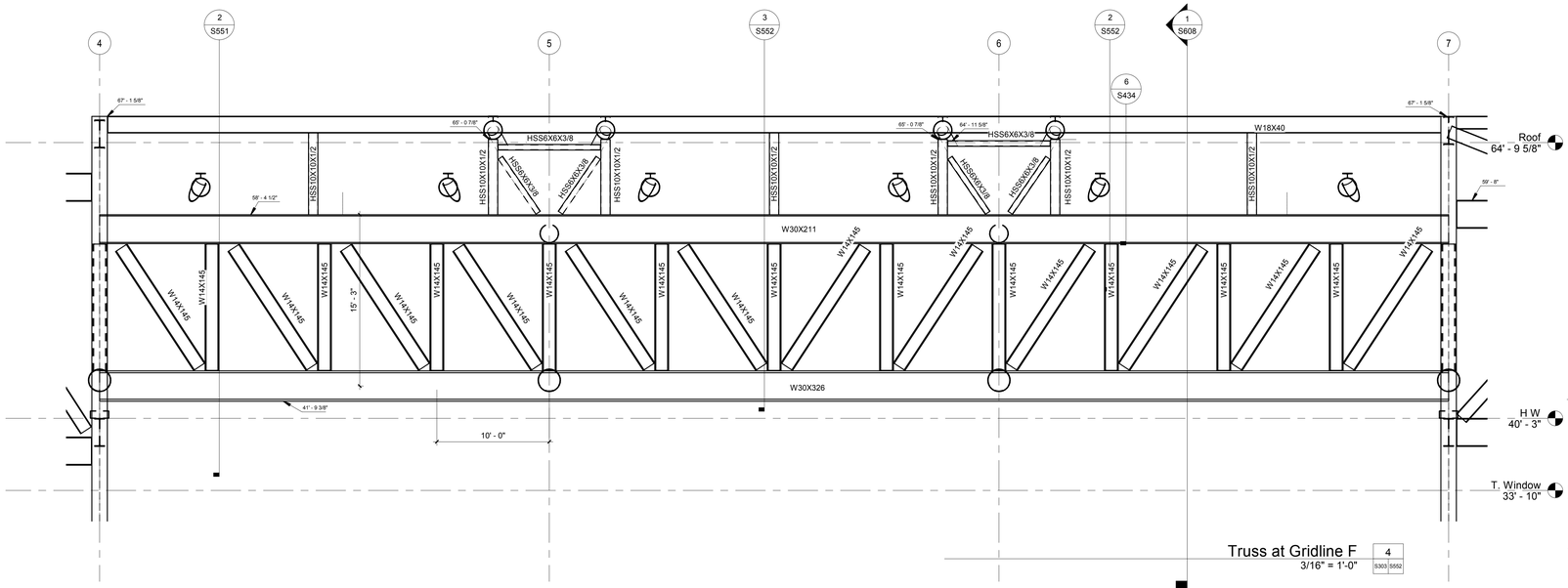


Truss Elevation at Diving Pool
3/16" = 1'-0"
2 | S303 S552

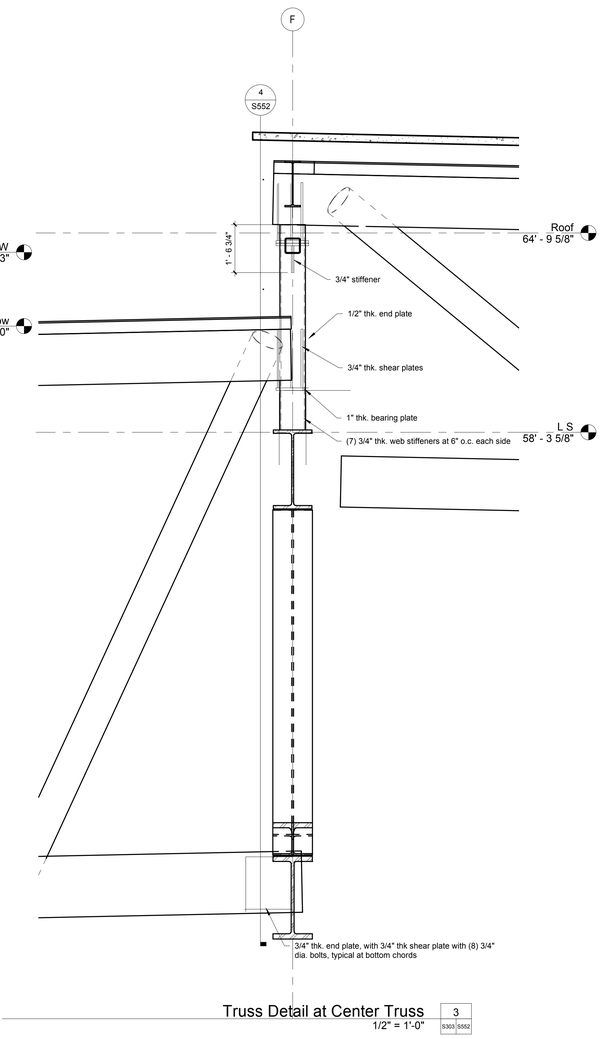


Notes:
1. Connections shall be detailed and designed by a Texas Professional Engineer
2. Provide 6" camber at center
3. Top and bottom chord splice shall be a concealed splice
4. All shall shall be galvanized after fabrication

Truss Section, Diving Pool
1/2" = 1'-0"
1 | S552 S552



Truss at Gridline F
3/16" = 1'-0"
4 | S303 S552



Truss Detail at Center Truss
1/2" = 1'-0"
3 | S303 S552

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS NOT TO BE CONSIDERED BY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Truss Details

Document issued for:
Construction Documents

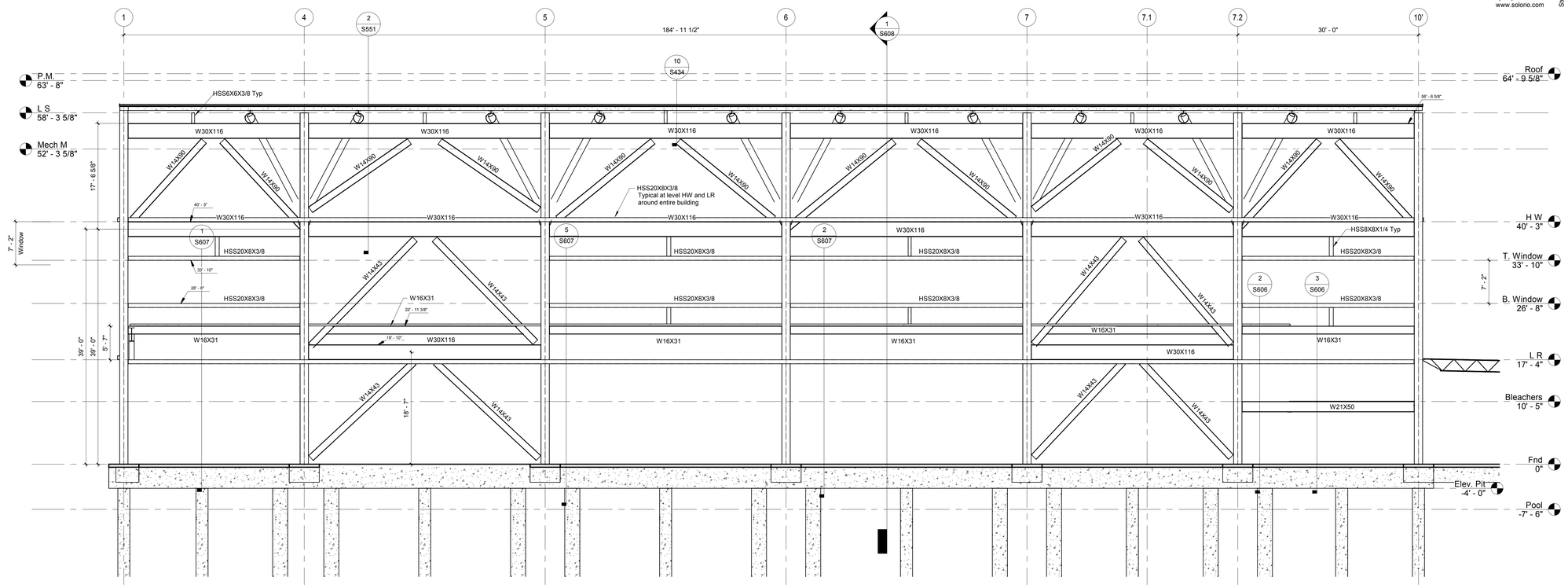
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

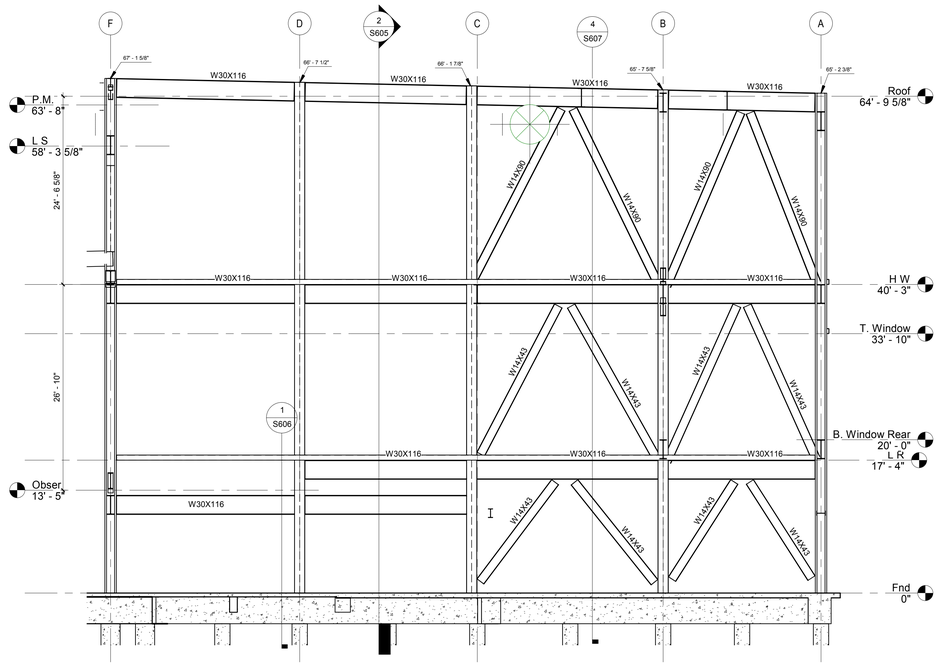
Project: 18323
Date: 6/7/2019

S552

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



Elevation 1 - a
1/8" = 1'-0"
1 | S202 | S601



Elevation 1 - a
1/8" = 1'-0"
3 | S202 | S601

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Elevations

Document issued for:
Construction Documents

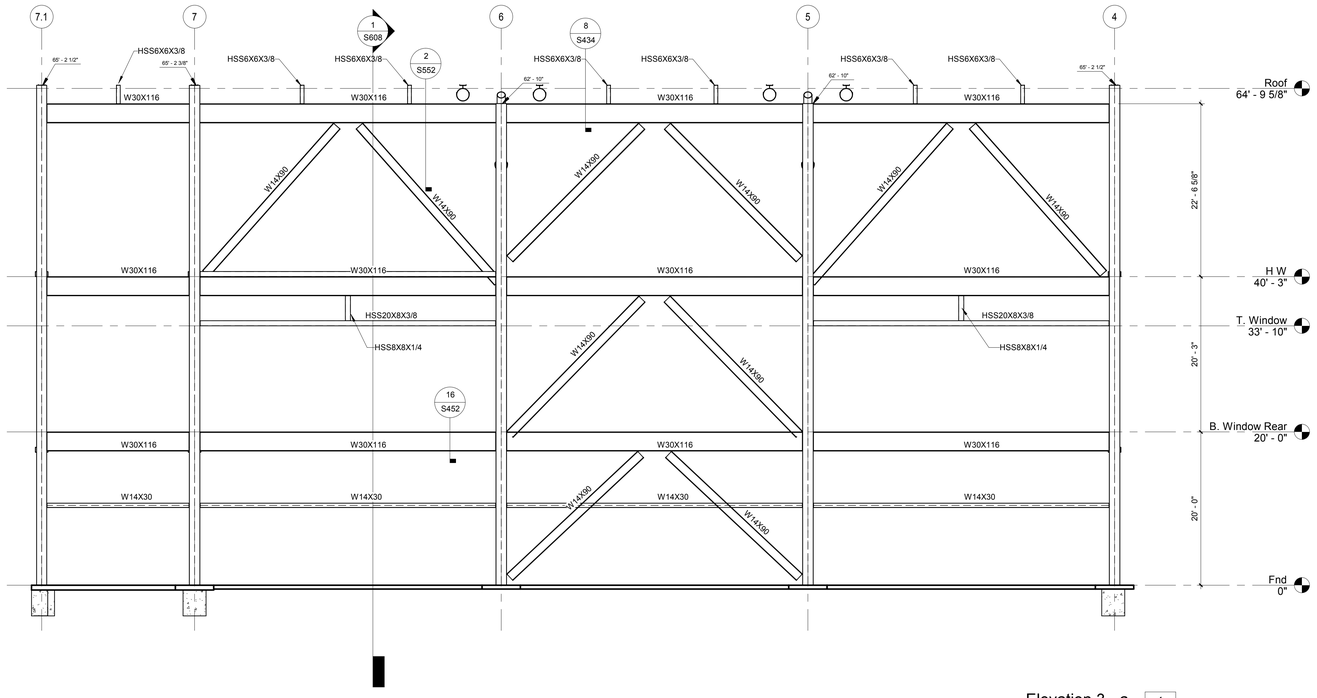
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

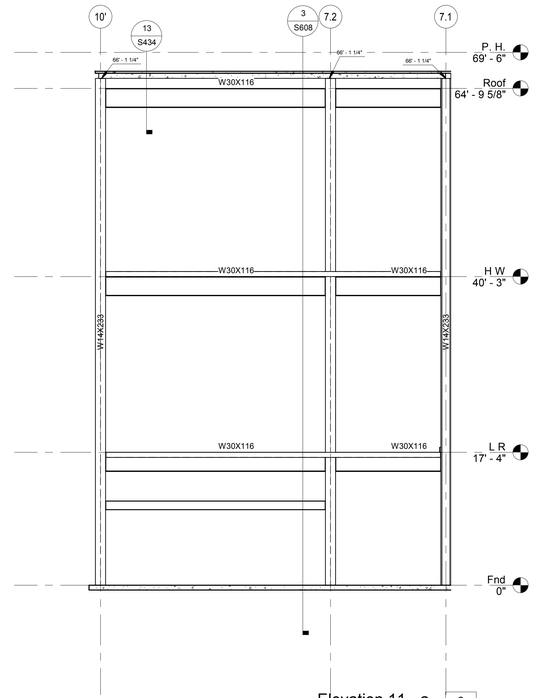
Project: 18323
Date: 6/7/2019

S601

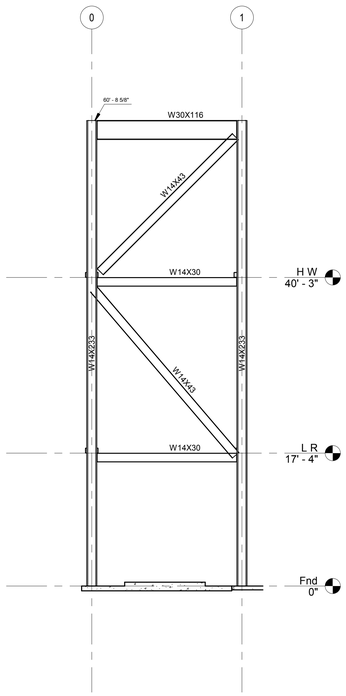
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



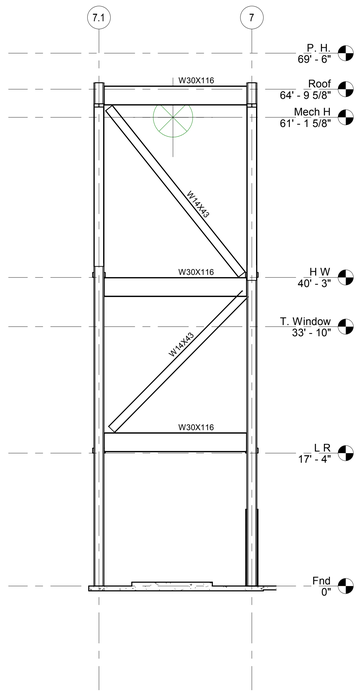
Elevation 3 - a
1/8" = 1'-0"
1 | S202 | S602



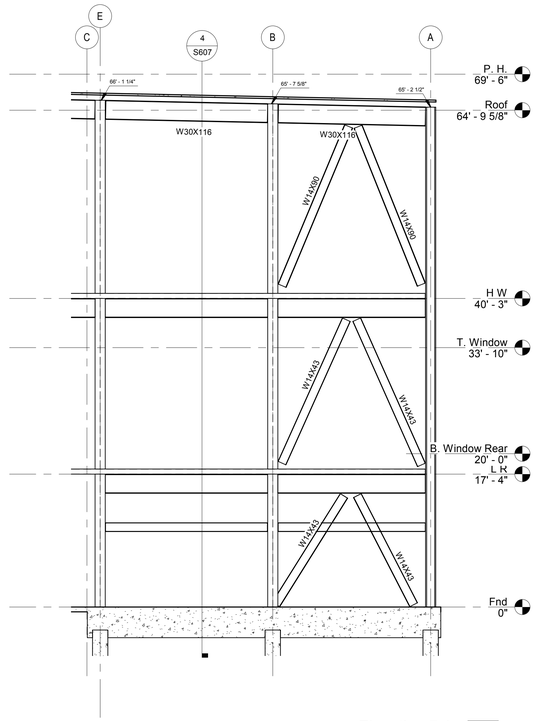
Elevation 11 - a
1/8" = 1'-0"
2 | S202 | S602



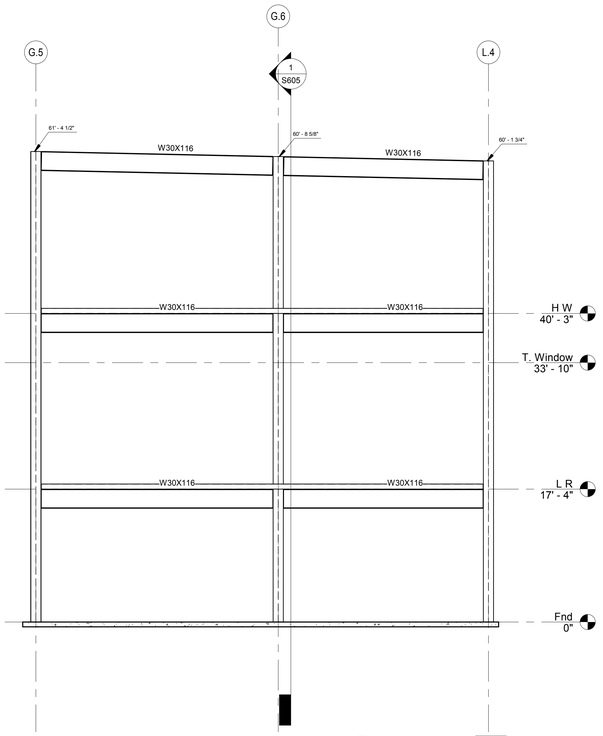
Elevation 11 - a
1/8" = 1'-0"
6 | S202 | S602



Elevation 12 - a
1/8" = 1'-0"
5 | S202 | S602



Elevation 7.1
1/8" = 1'-0"
4 | S202 | S602



Elevation 1 - a
1/8" = 1'-0"
3 | S202 | S602

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE LICENSED ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Elevations

Document issued for:
Construction Documents

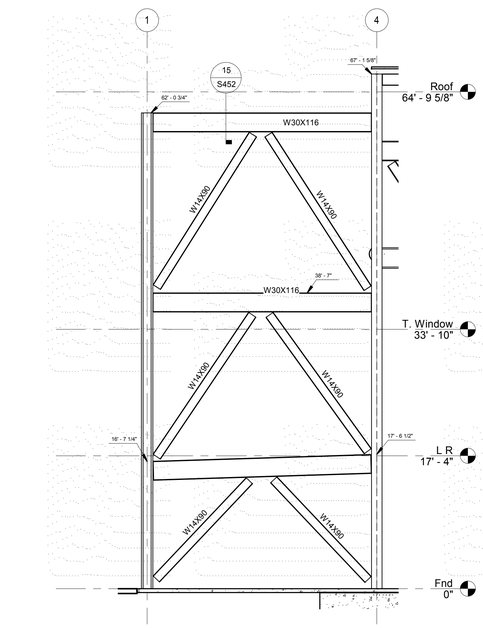
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

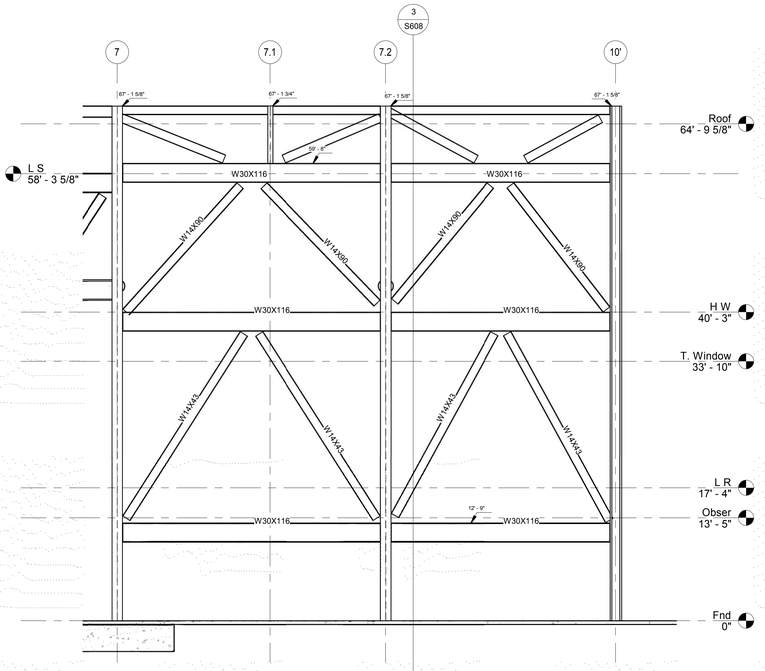
Project: 18323
Date: 6/7/2019

S602

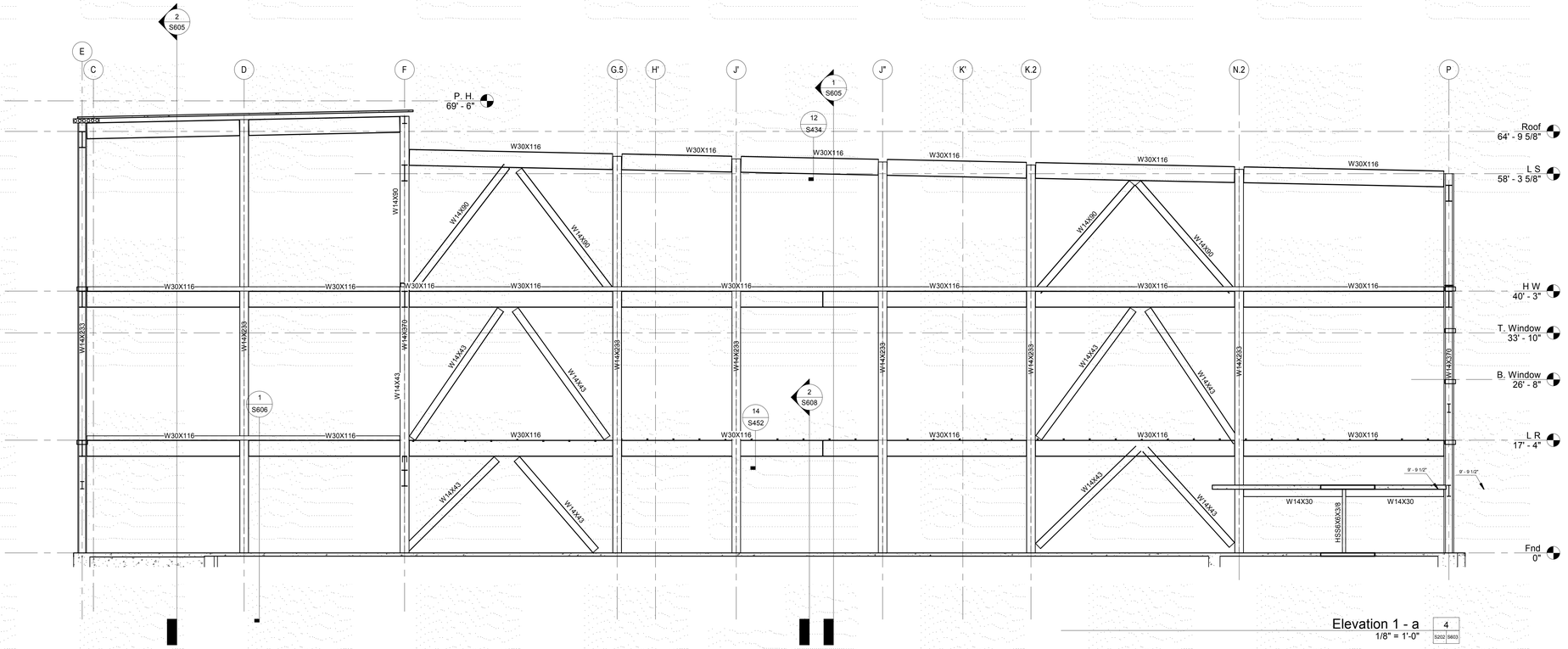
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F-1615



Elevation Gridline F Brace 1
1/8" = 1'-0" S202 S603



Elevation Gridline F 2
1/8" = 1'-0" S202 S603



Elevation 1 - a 4
1/8" = 1'-0" S202 S603

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS PRELIMINARY AND THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Elevations

Document issued for:
Construction Documents

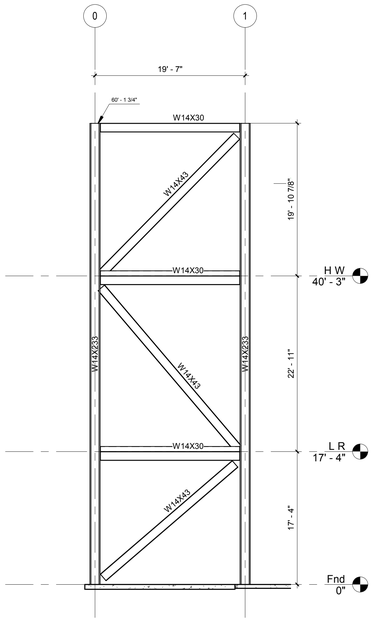
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

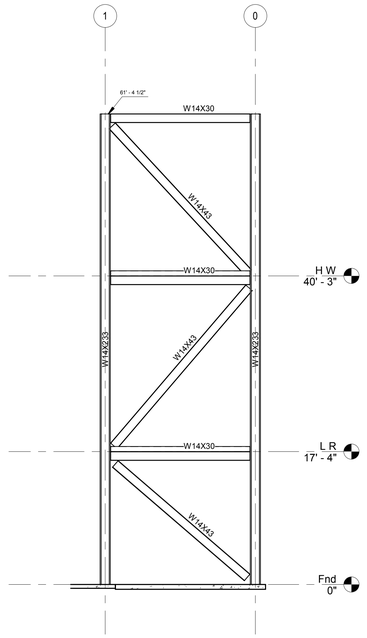
Project: 18323
Date: 6/7/2019

S603

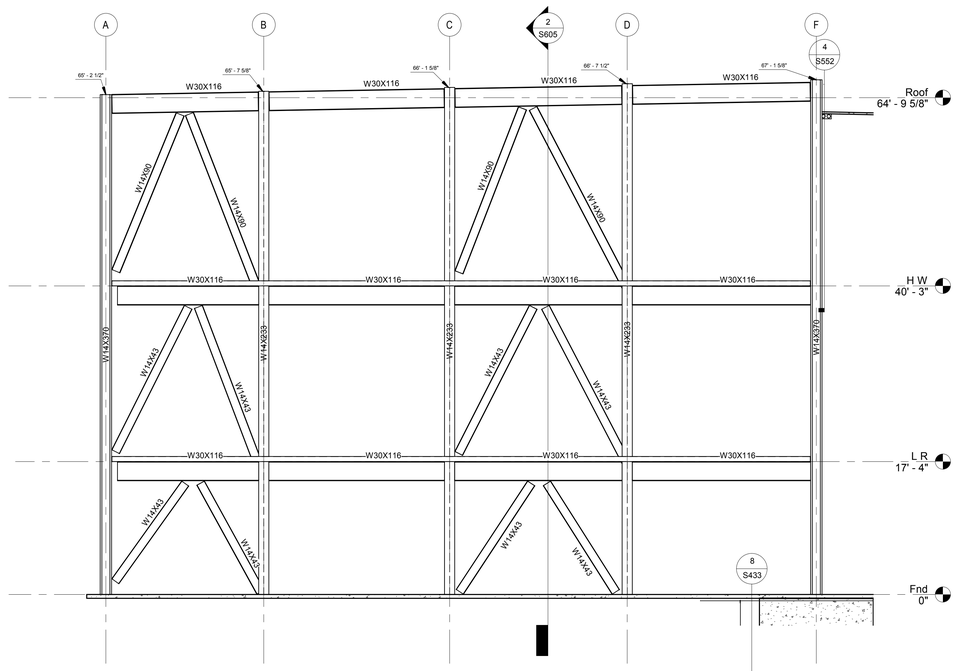
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



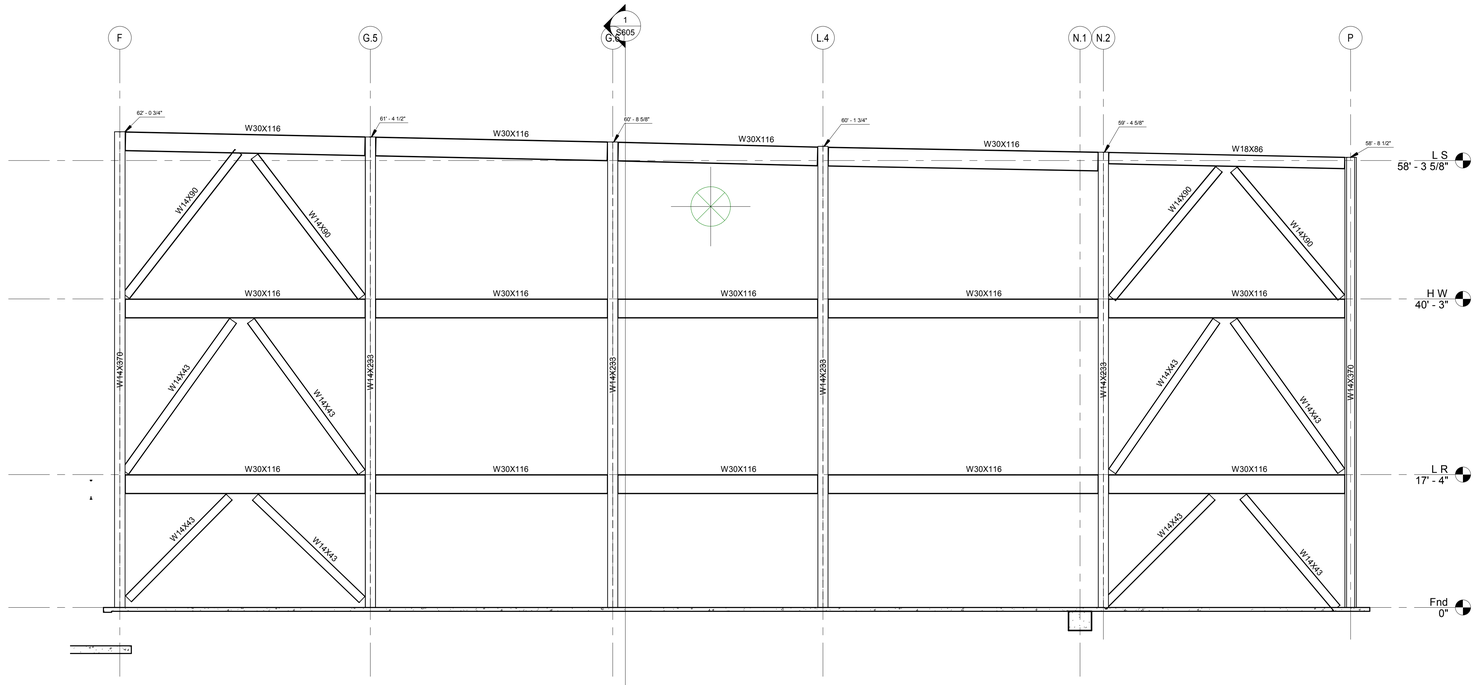
Elevation Gridline L.4
1/8" = 1'-0"
4 | S202 | S604



Elevation Gridline G.5
1/8" = 1'-0"
3 | S202 | S604



Elevation 1 - a
1/8" = 1'-0"
1 | S202 | S604



Elevation 2 - a
1/8" = 1'-0"
2 | S202 | S604

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS NOT TO BE USED BY THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Elevations

Document issued for:
Construction Documents

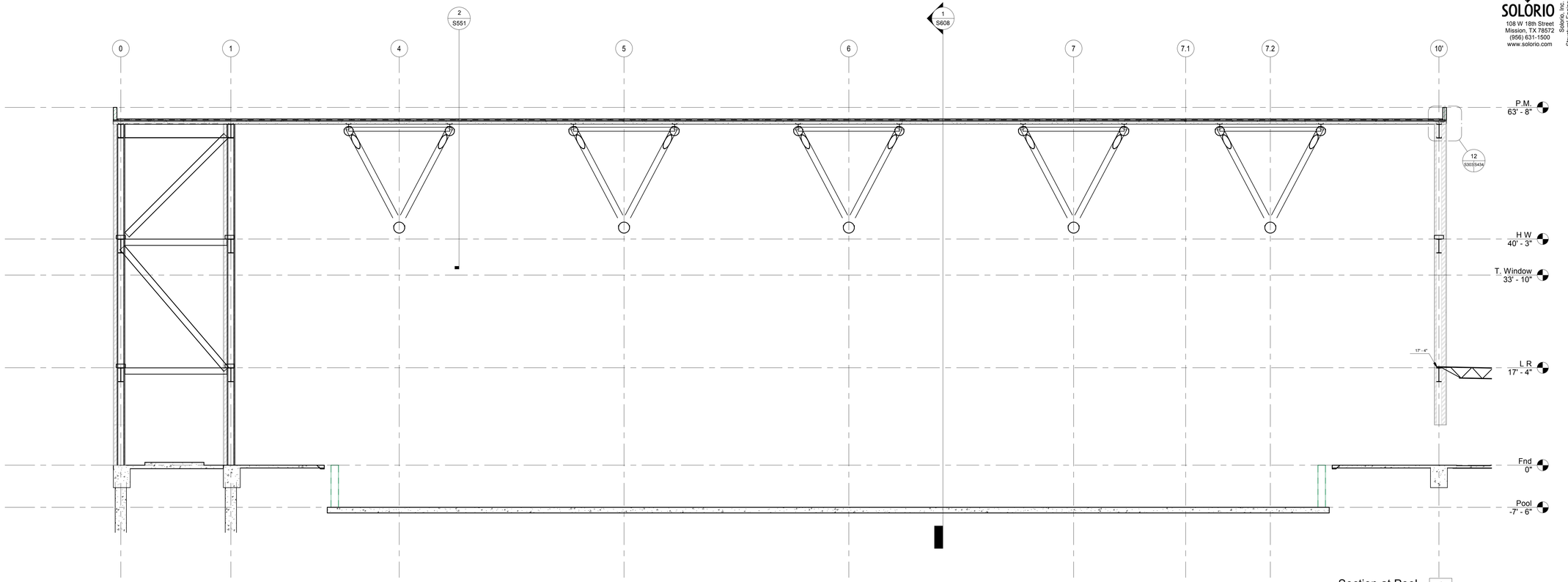
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

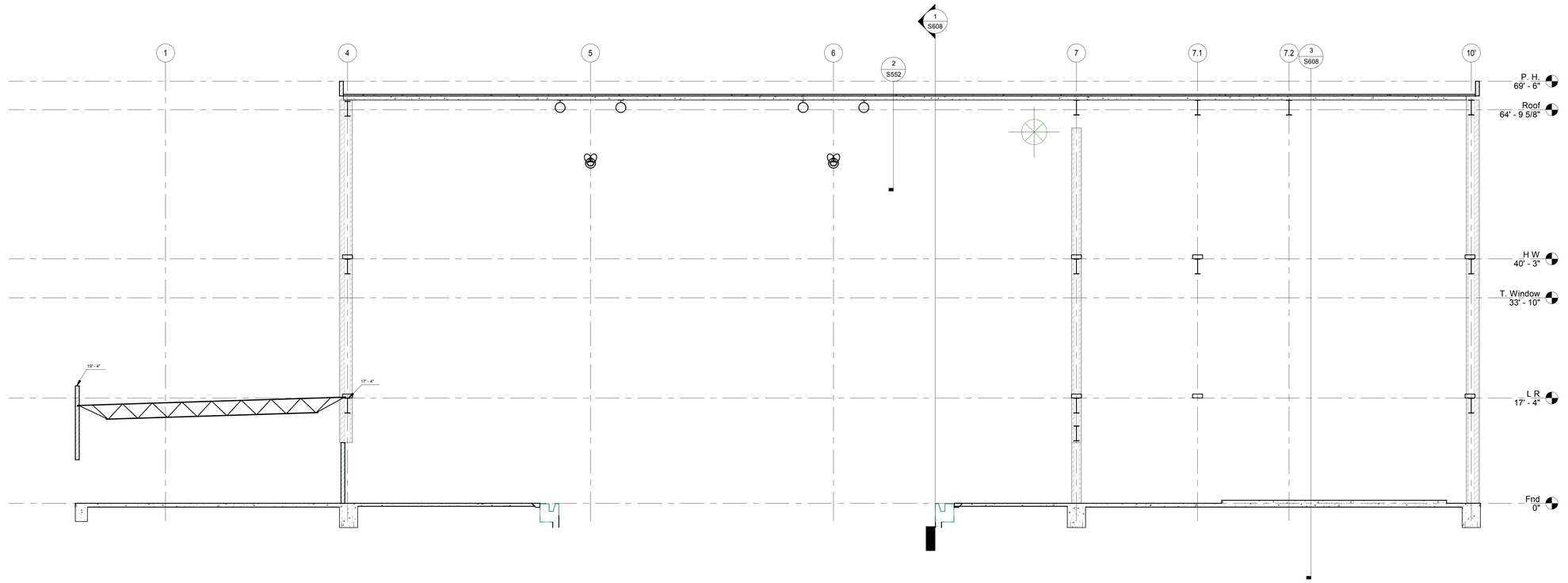
Project: 18323
Date: 6/7/2019

S604

SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



Section at Pool
1/8" = 1'-0"
1 S202 S605



Section at Diving Pool
1/8" = 1'-0"
2 S202 S605

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE REGISTERED ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Building Sections

Document issued for:
Construction Documents

PROPOSED

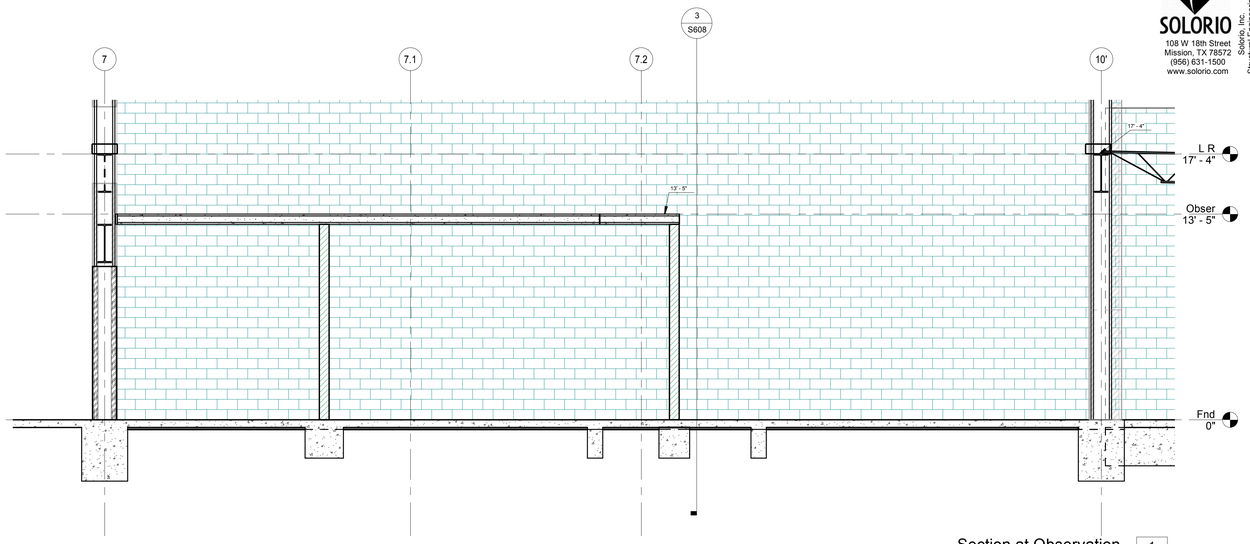
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

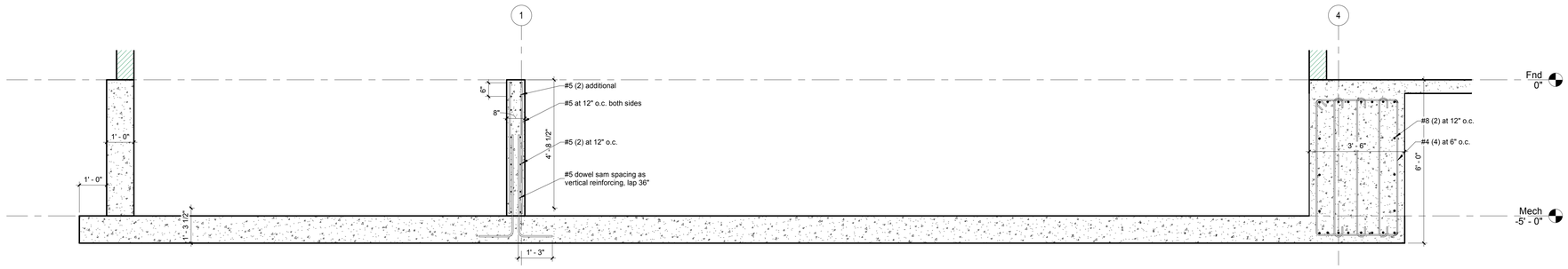
S605

6/11/2019 12:02:18 PM H:\Sharefile\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt

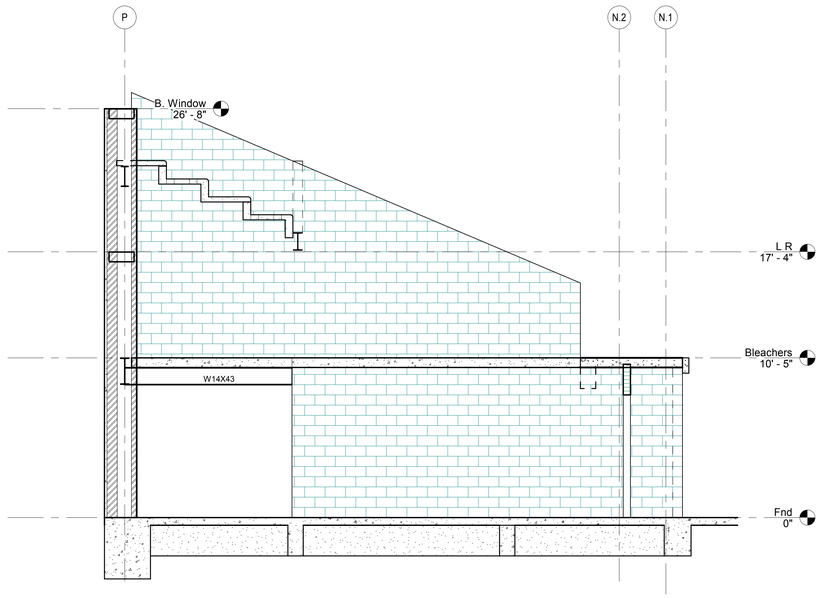
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



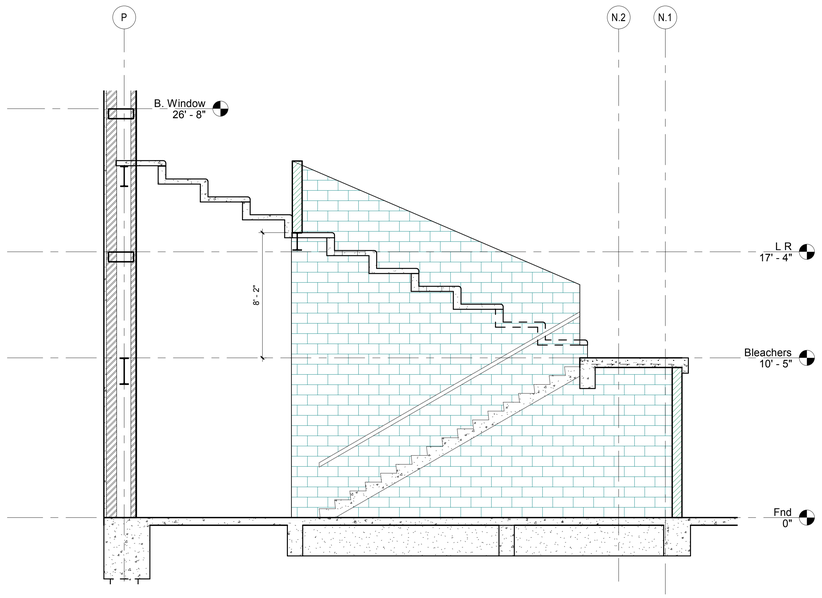
Section at Observation 1 (S601 | S606)
1/4" = 1'-0"



Detail at Pit 4 (S202 | S606)
1/2" = 1'-0"



Stairs at Bleachers 2 3 (S202 | S606)
1/4" = 1'-0"



Stairs at Bleachers 1 2 (S202 | S606)
1/4" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION TO THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Building Sections

Document issued for:
Construction Documents

PROPOSED

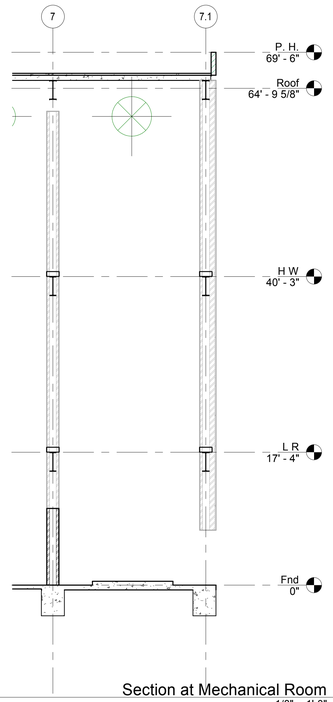
CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

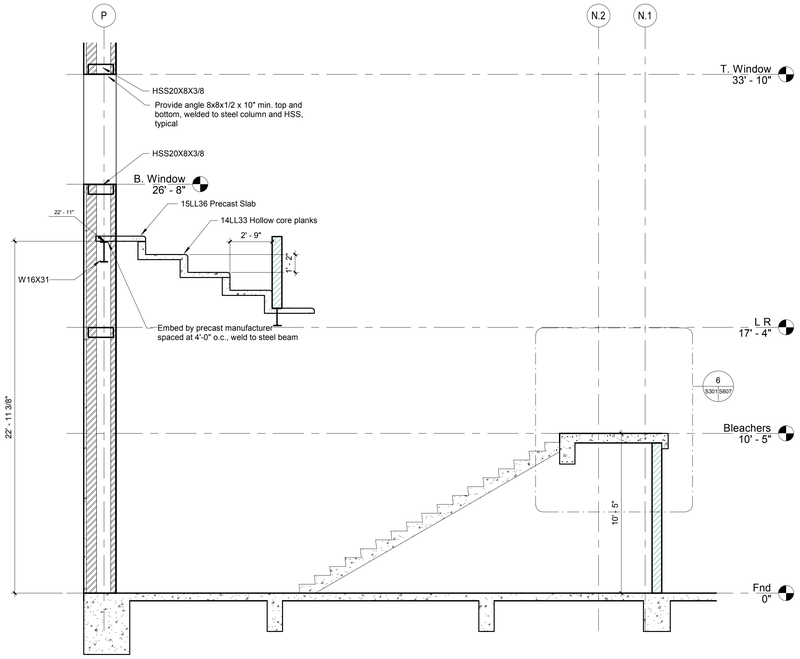
S606

6/11/2019 12:02:19 PM H:\Shared\Personal Folders\01 My Projects\WG\18323 WG aquatic center pharr\struct\18323 WG aquatic center_100_CD_06_10_2019.rvt

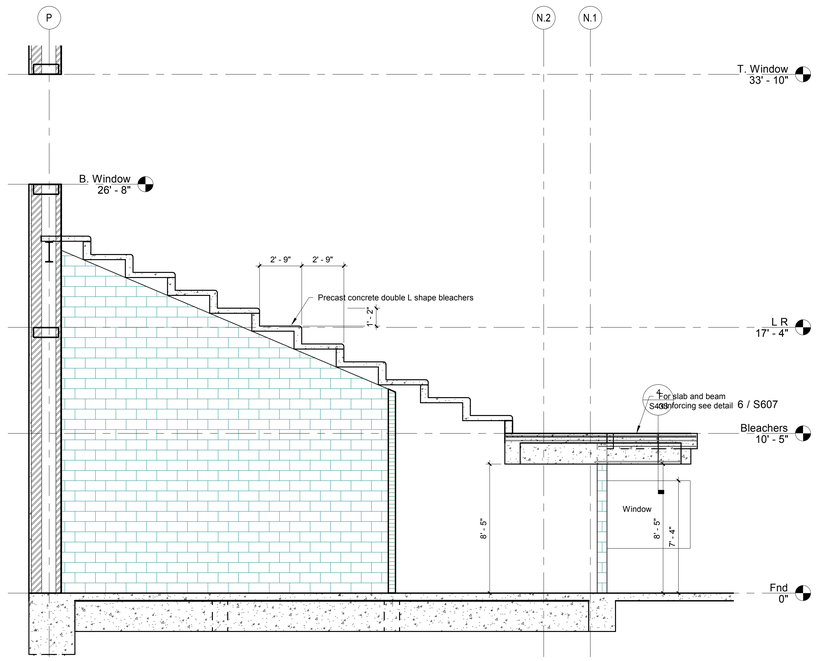
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



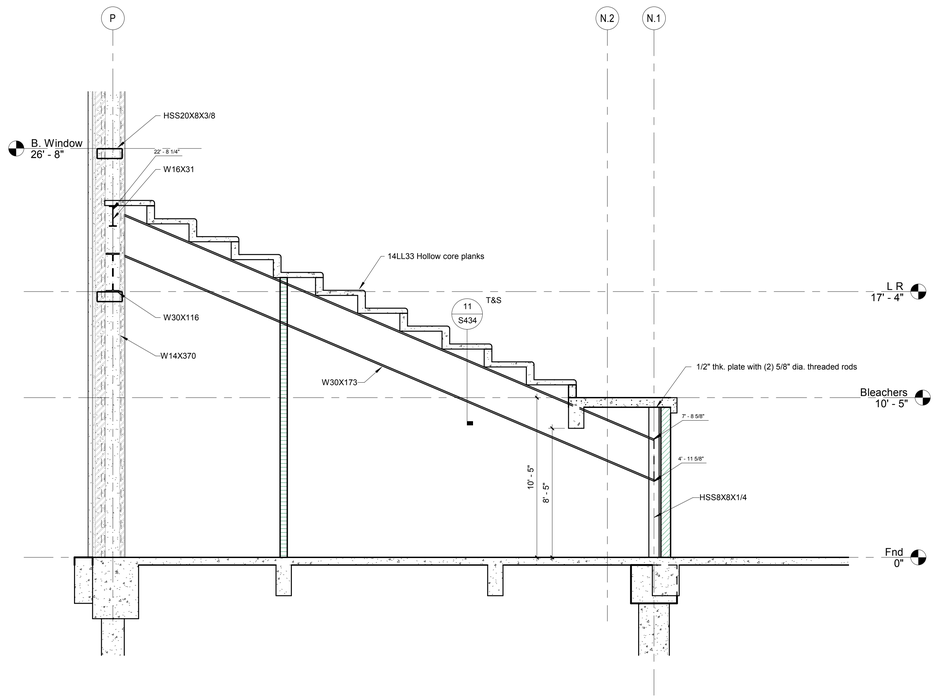
Section at Mechanical Room
1/8" = 1'-0"
4 | S601 S607



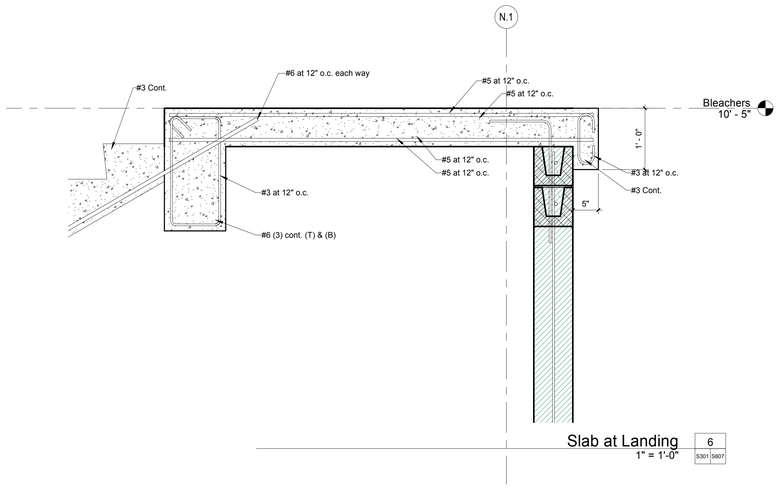
Section at Stairs
1/4" = 1'-0"
2 | S202 S607



Section at Timing Room
1/4" = 1'-0"
1 | S202 S607



Section at Bleachers
1/4" = 1'-0"
5 | S202 S607



Slab at Landing
1" = 1'-0"
6 | S301 S607

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS NOT TO BE USED BY ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Building Sections

Document issued for:
Construction Documents

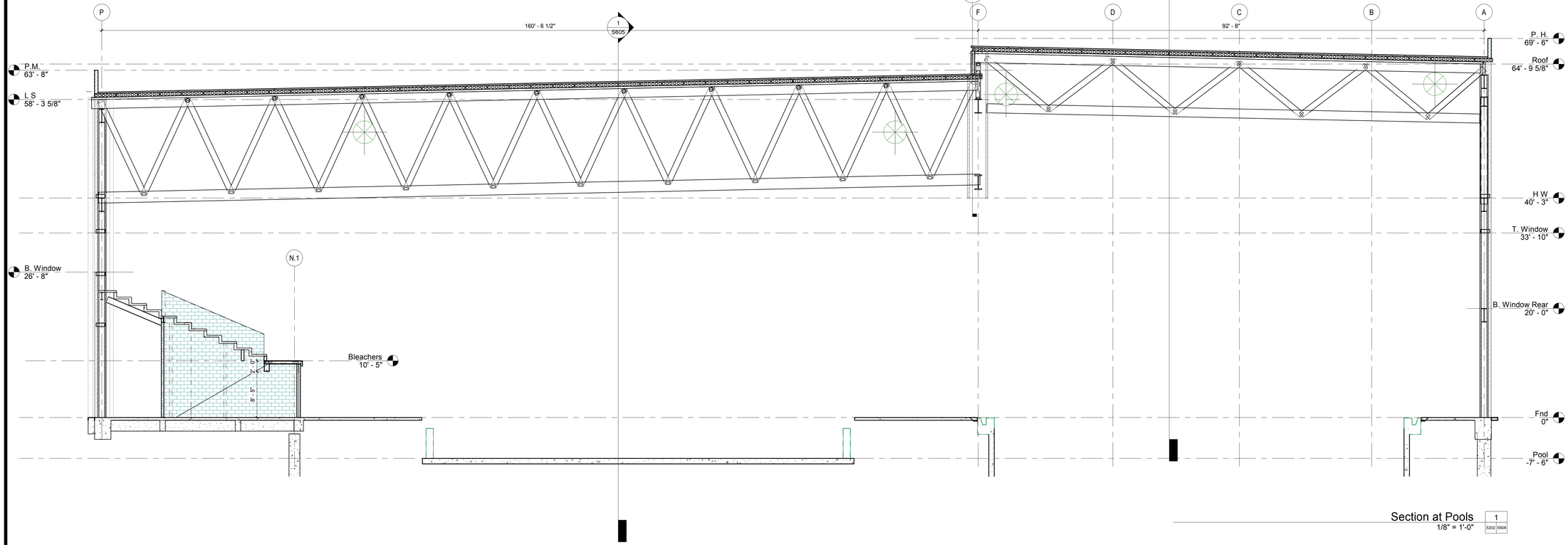
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

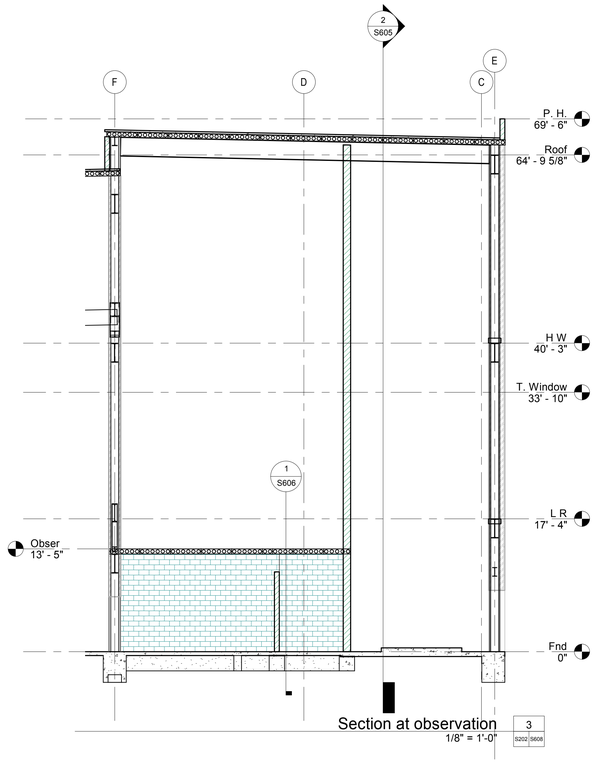
Project: 18323
Date: 6/7/2019

S607

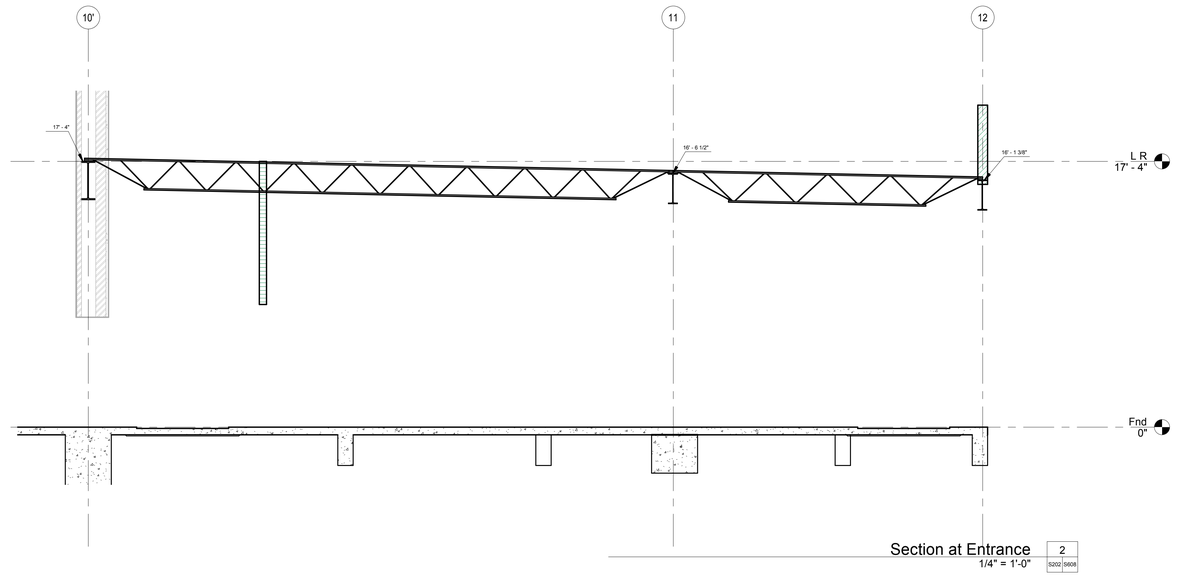
SOLORIO
108 W 18th Street
Mission, TX 78572
(956) 631-1500
www.solorio.com
Solorio, Inc.
Structural Engineering
F 1615



Section at Pools
1/8" = 1'-0"
1 / S202 S608



Section at observation
1/8" = 1'-0"
3 / S202 S608



Section at Entrance
1/4" = 1'-0"
2 / S202 S608

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
SIMON G. SOLORIO JR.
83066
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY SIMON G. SOLORIO JR. P.E. 83066 ON 6/7/2019. THIS DOCUMENT WITHOUT PROPER NOTIFICATION IS NOT TO BE USED. THE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

Revision	Date	Issued by	DESCRIPTION

Building Sections

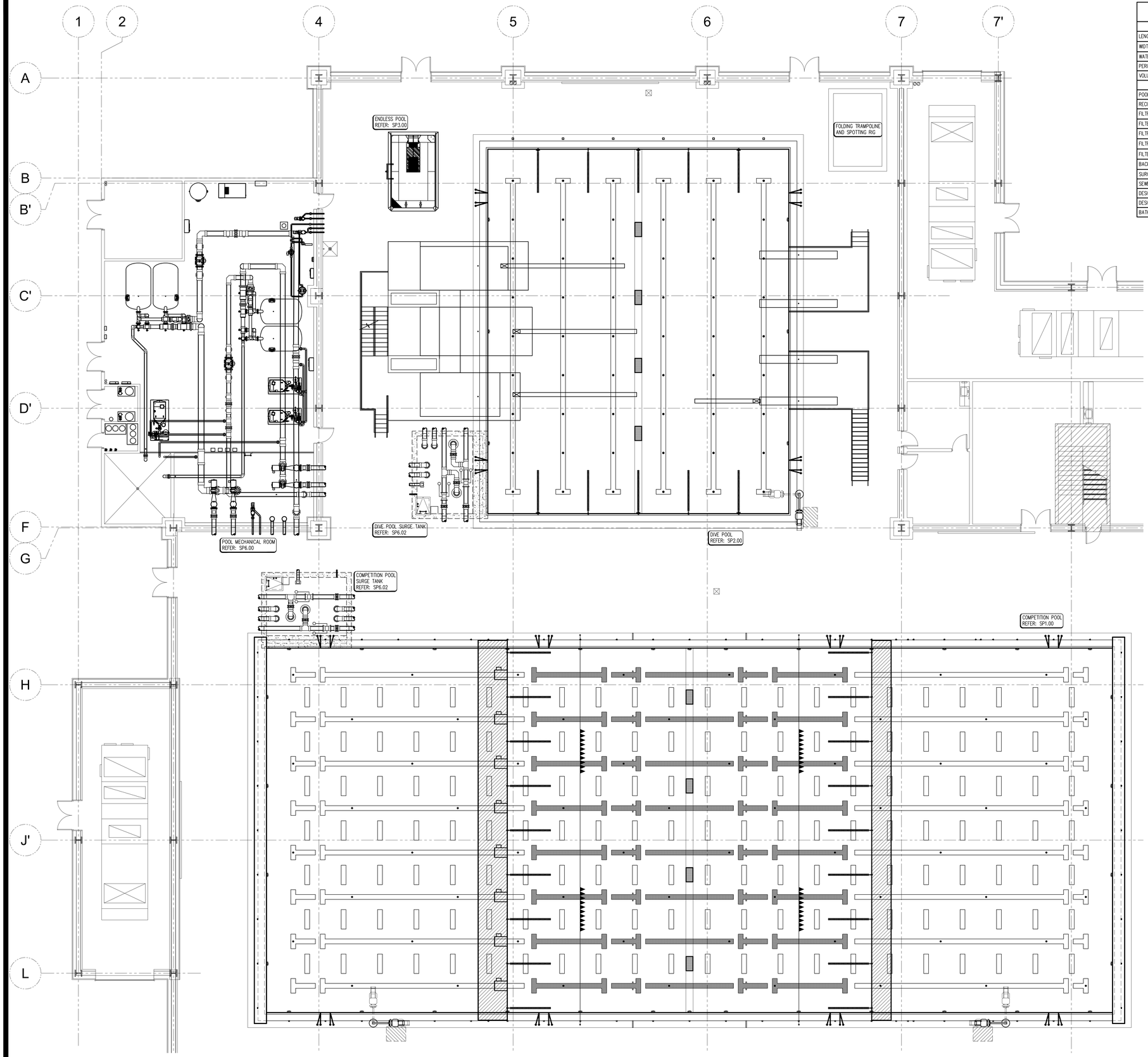
Document issued for:
Construction Documents

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

Project: 18323
Date: 6/7/2019

S608



DESIGN DATA

	UNITS	COMPETITION POOL	DIVE POOL
LENGTH (NOMINAL)	FT.	175	75
WIDTH (NOMINAL)	FT.	75	62
WATER SURFACE AREA	SQ. FT.	13,083	4,655
PERIMETER	FT.	501	274
VOLUME	GALLON	709,702	596,346
CIRCULATION SYSTEM & FILTERS			
POOL TURNOVER RATE	HOUR	5.14	4.97
RECIRCULATION RATE	GPM	2,300	2,000
FILTRATION RATE (MAX. DESIGN)	GPM/SQ. FT.	13.0	13.0
FILTER AREA REQUIRED	SQ. FT.	176.9	153.8
FILTRATION RATE (ACTUAL)	GPM/SQ. FT.	12.6	12.3
FILTRATION AREA (ACTUAL)	SQ. FT.	183.2	163.2
FILTER BACKWASH RATE	GPM/SQ. FT.	15.0	15.0
BACKWASH FLOW RATE (PER FILTER)	GPM	687	612
SURGE CAPACITY	GALLON	13,195	7,330
SEWER CAPACITY	GPM	UNKNOWN	UNKNOWN
DESIGN FILL RATE	GPM	164	163
DESIGN FILL TIME	HOUR	72	61
BATHER LOAD	PERSON	523	138

GENERAL POOL NOTES

1. ⚓ DENOTES WATER DEPTH FROM WATER LEVEL.
2. POOL FINISH SHALL BE A PROPRIETARY AGGREGATE PLASTER WITH A 6" VERTICAL TILE BAND AND A 1'-5" FOR COMPETITION POOL AND 1'-4" FRO DIVE POOL PERIMETER TILE BAND WITH TILE DECK MARKINGS.
3. ALL STAIR TREADS SHALL HAVE A SLIP RESISTANT FINISH.
4. TYPICAL POOL DIMENSIONS SHOWN ARE FROM INSIDE FINISHED POOL WALL.
5. REFER TO POOL STRUCTURAL DRAWINGS FOR ALL DIMENSIONS RELATING TO THE THICKNESS OF THE POOL SHELL.
6. THE JUNCTION BETWEEN THE SWIMMING POOL WALL AND THE FLOOR SHALL BE COVED WITH A MAXIMUM 6" RADIUS.
7. DEPTH MARKERS AND WARNING SIGNS ARE SHOWN IN APPROXIMATE LOCATIONS. DEPTH MARKERS AND WARNING SIGNS SHALL NOT EXCEED 25'-0" APART FROM EACH OTHER, AND SHALL BE PLACED AT EVEN FOOT INTERVALS PER LOCAL CODE.
8. ALL PROPRIETARY NAMES MENTIONED ARE TO DESIGNATE PERFORMANCE STANDARDS. EQUIVALENT PRODUCTS SHALL BE SUBMITTED FOR APPROVAL.
9. SLIP RESISTANT DECK FINISH REQUIRED. REFER TO ARCHITECT.
10. REFER TO PLUMBING FOR DECK DRAINS AND HOSE BIBBS.
11. ALL SURFACE WATER SHALL DRAIN AWAY FROM THE POOL.
12. REFER TO ELECTRICAL FOR GFI OUTLETS IN NATATORIUM.
13. ELECTRICAL INSPECTOR SHALL APPROVE INSTALLATION OF BONDING GRID FOR POOL REINFORCING AND ALL POOL EMBEDS PRIOR TO PLACEMENT OF CONCRETE.
14. NO GROUND WATER SHALL BE ALLOWED TO RISE ABOVE ANY PORTION OF THE POOL BOTTOM DURING CONSTRUCTION.
15. COMPETITION POOL HAS BEEN DESIGNED TO BE IN COMPLIANCE WITH THE RULES AND REGULATIONS OF USA SWIMMING (USA) AND THE NATIONAL FEDERATION OF STATE HIGH SCHOOL ASSOCIATIONS (NFSHSA)
16. REFER TO SWIMMING POOL SPECIFICATIONS FOR COMPETITION RACE COURSE TOLERANCES.
17. BULKHEAD DIMENSION SHOWN ON COURSE LAYOUT(S) INCLUDE BULKHEAD TOLERANCE.
18. TIMING SYSTEM SHOWN FOR REFERENCE ONLY. REFER ARCHITECTURAL AND ELECTRICAL DRAWINGS.
19. ALL POOL REINFORCING STEEL, METAL FITTINGS, EQUIPMENT WITHIN 5'-0" OF POOL EDGE AND ANY METAL PARTS OF POOL EQUIPMENT IN CONTACT WITH POOL RECIRCULATION SYSTEM SHALL BE BONDED PER NEC 680. REFER: 11/SP6.04

DRAWING INDEX

POOL ALTERNATES

ALTERNATE #2 – GENERAL CONTRACTOR TO PROVIDE COST FOR AN ENDLESS POOL LOCATED NORTH OF THE DIVING WELL, WHICH WILL SIT ON DECK AND IS USED FOR TRAINING.

1 SP0.00 **POOL REFERENCE PLAN**
1/8" = 1'-0"

NORTH

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION DOCUMENTS

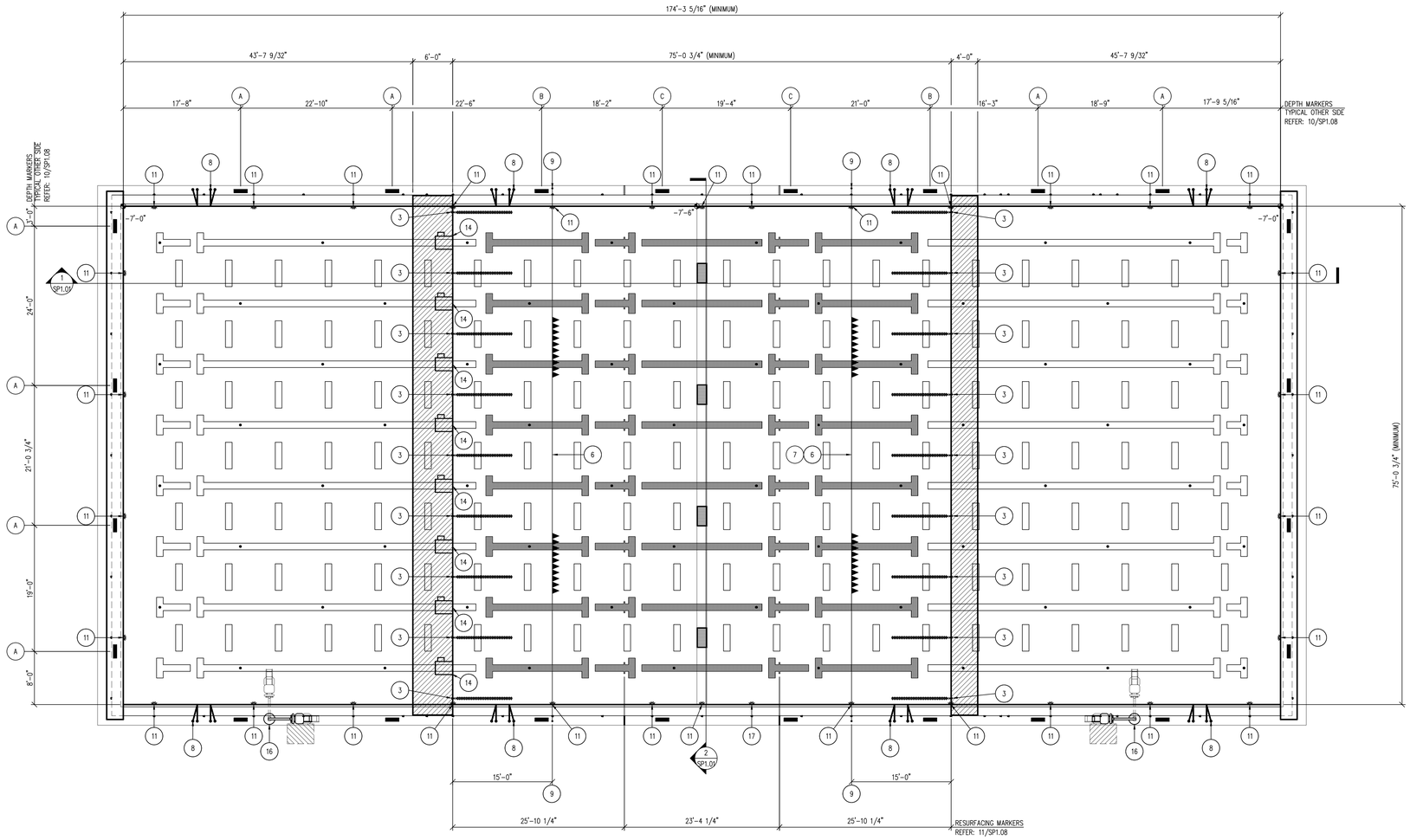
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 071805
DATE 06/07/2019
REVISED

SP0.00
POOL REFERENCE PLAN



1 SP1.00 **COMPETITION POOL PLAN (25 YARD COURSE LAYOUT 1)**

1/8" = 1'-0"

DEPTH MARKINGS SCHEDULE

ID	SIGNAGE
A	7 FT 0 IN
B	7 FT 3 IN
C	7 FT 6 IN

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR @ PARAPET REFER: 1/SP1.08
	2	LANE ROPE CUP ANCHOR @ ROLLOUT REFER: 2/SP1.08
	3	LANE ROPE CUP ANCHOR @ BULKHEAD REFER: 10/SP1.09
	4	LANE ROPE EXTENSION @ PARAPET REFER: 6/SP1.08
	5	LANE ROPE EXTENSION @ ROLLOUT REFER: 7/SP1.08
	6	BACKSTROKE PENNANT
	7	FALSE START ROPE ASSEMBLY
	8	GRAB RAILS AND RECESSED STEPS REFER: 12/SP1.08
	9	STANCHION POST AND ANCHOR REFER: 6/SP1.09
	10	TAGLINE POST AND ANCHOR REFER: 4/SP1.09
	11	UNDERWATER LIGHT REFER: 11/SP1.09
	12	DECK MOUNTED STARTING PLATFORM REFER: 2/SP1.09
	13	PARAPET MOUNTED STARTING PLATFORM REFER: 1/SP1.09
	14	BULKHEAD MOUNTED STARTING PLATFORM REFER: 5/SP1.09
	15	FLOATING WATER POLO GOAL REFER: 12/SP1.09
	16	POOL LIFT AND ANCHOR REFER: 13/SP1.08
	17	STANCHION POST AND ANCHOR @ BULKHEAD REFER: 3/SP1.09

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

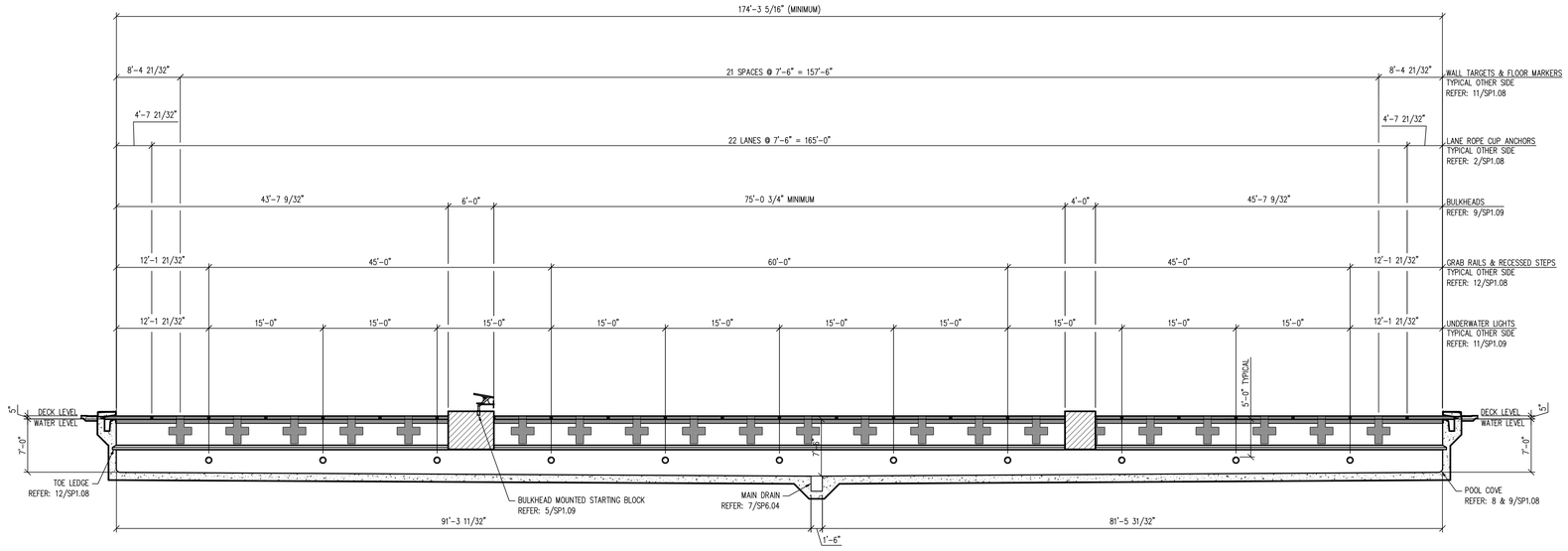
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

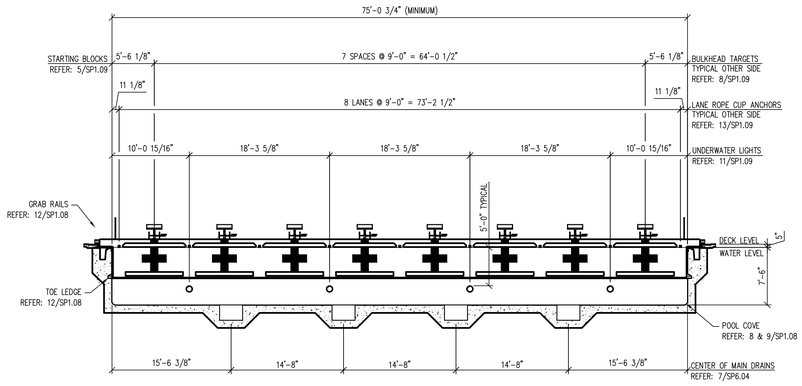
PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.00
COMPETITION POOL PLAN



1 SP1.01 **COMPETITION POOL SECTION**

1/8" = 1'-0"



2 SP1.01 **COMPETITION POOL SECTION**

1/8" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION
DOCUMENTS

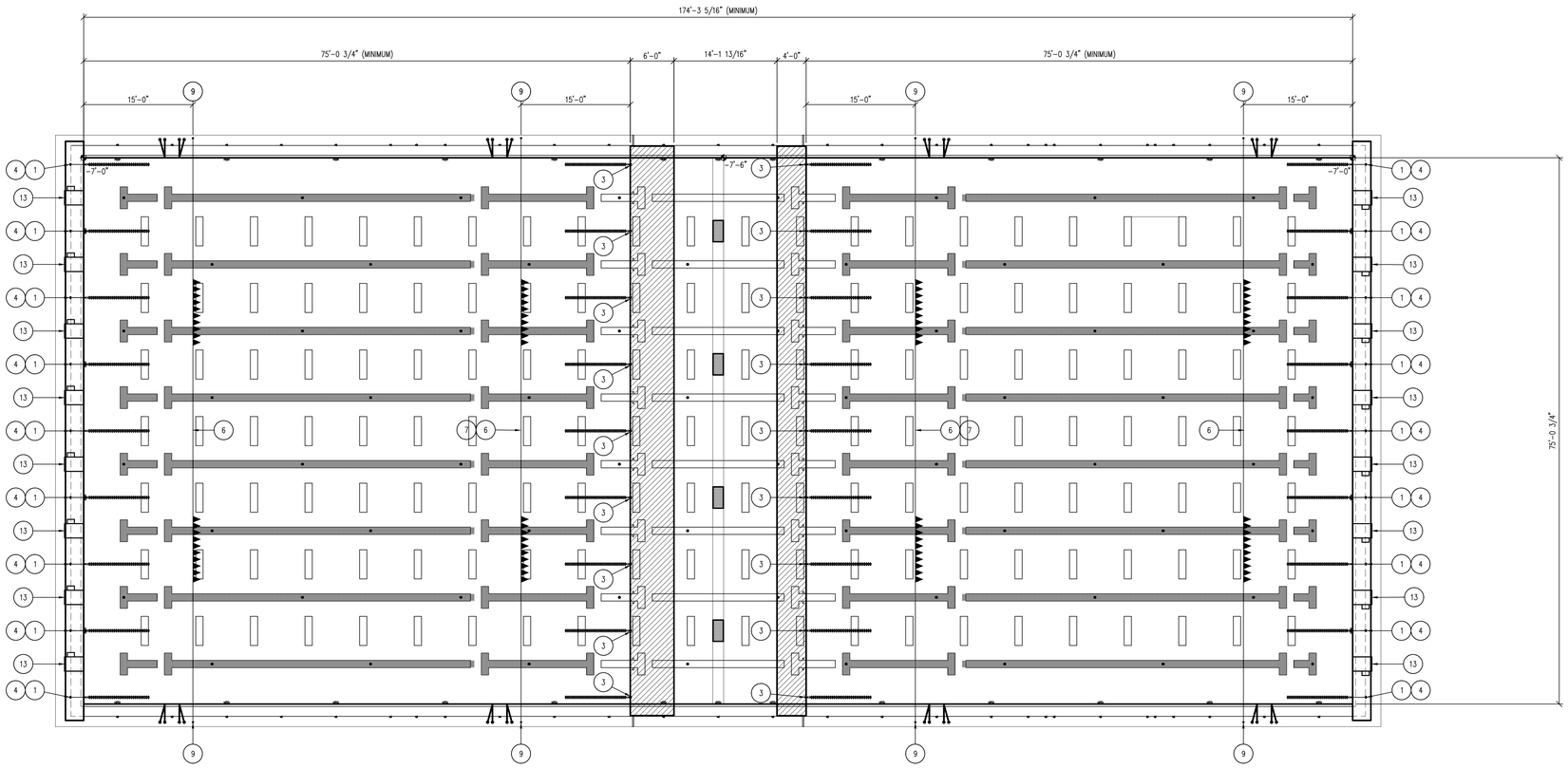
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

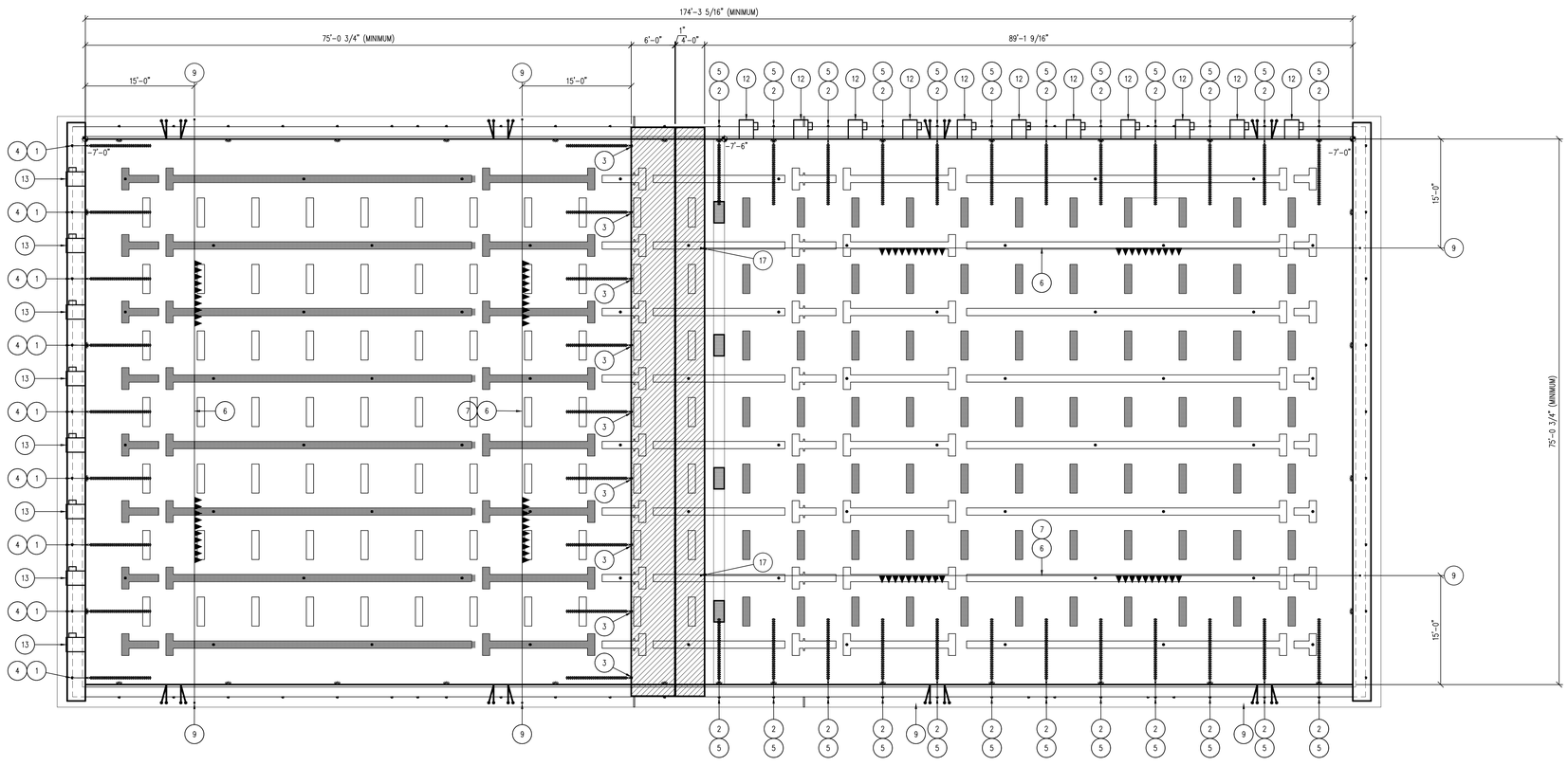
PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.01
COMPETITION POOL SECTIONS



1 SP1.02 **25 YARD COURSE LAYOUT 2**

1/8" = 1'-0"



2 SP1.02 **25 YARD COURSE LAYOUT 3**

1/8" = 1'-0"

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR @ PARAPET REFER: 1/SP1.08
	2	LANE ROPE CUP ANCHOR @ ROLLOUT REFER: 2/SP1.08
	3	LANE ROPE CUP ANCHOR @ BULKHEAD REFER: 10/SP1.09
	4	LANE ROPE EXTENSION @ PARAPET REFER: 6/SP1.08
	5	LANE ROPE EXTENSION @ ROLLOUT REFER: 7/SP1.08
	6	BACKSTROKE PENNANT
	7	FALSE START ROPE ASSEMBLY
	8	GRAB RAILS AND RECESSED STEPS REFER: 12/SP1.08
	9	STANCHION POST AND ANCHOR REFER: 6/SP1.09
	10	TAGLINE POST AND ANCHOR REFER: 4/SP1.09
	11	UNDERWATER LIGHT REFER: 11/SP1.09
	12	DECK MOUNTED STARTING PLATFORM REFER: 2/SP1.09
	13	PARAPET MOUNTED STARTING PLATFORM REFER: 1/SP1.09
	14	BULKHEAD MOUNTED STARTING PLATFORM REFER: 5/SP1.09
	15	FLOATING WATER POLO GOAL REFER: 12/SP1.09
	16	POOL LIFT AND ANCHOR REFER: 13/SP1.08
	17	STANCHION POST AND ANCHOR @ BULKHEAD REFER: 3/SP1.09

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			

CONSTRUCTION DOCUMENTS

PROPOSED

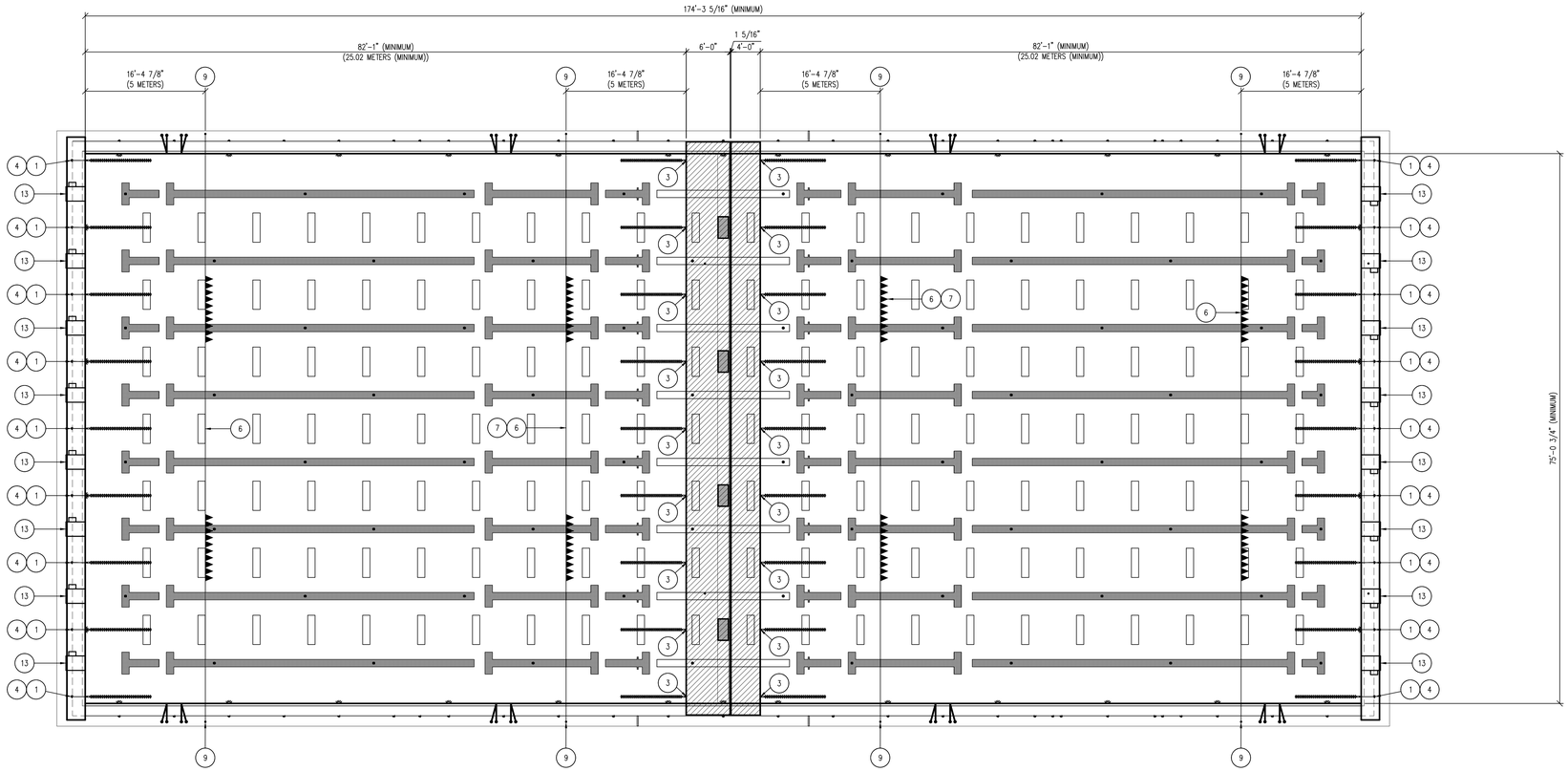
CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

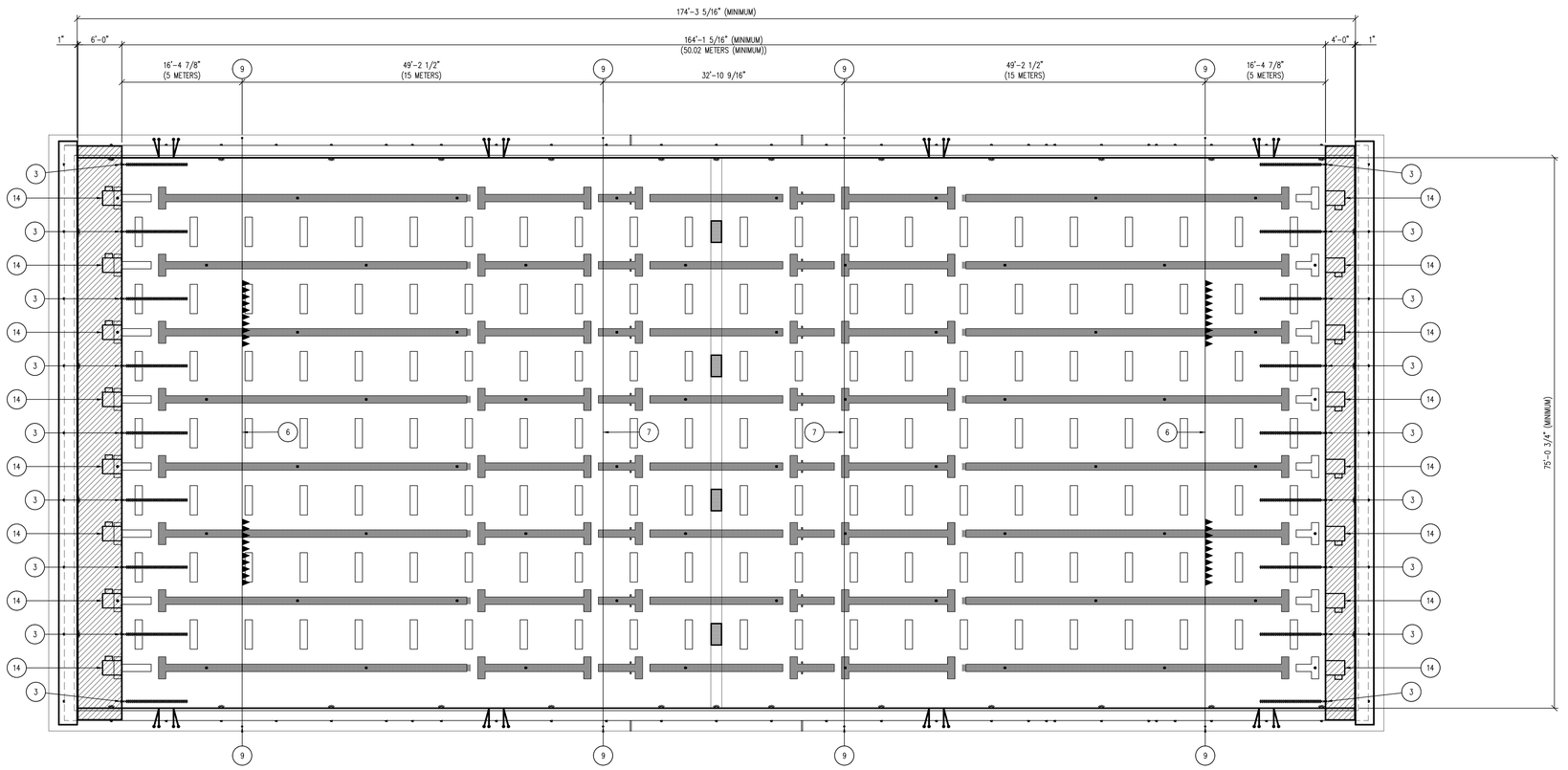
SP1.02

COMPETITION POOL COURSE LAYOUTS



1 SP1.03 **25 METER COURSE LAYOUT**

1/8" = 1'-0"



2 SP1.03 **50 METER COURSE LAYOUT**

1/8" = 1'-0"

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR @ PARAPET REFER: 1/SP1.08
	2	LANE ROPE CUP ANCHOR @ ROLLOUT REFER: 2/SP1.08
	3	LANE ROPE CUP ANCHOR @ BULKHEAD REFER: 10/SP1.09
	4	LANE ROPE EXTENSION @ PARAPET REFER: 6/SP1.08
	5	LANE ROPE EXTENSION @ ROLLOUT REFER: 7/SP1.08
	6	BACKSTROKE PENNANT
	7	FALSE START ROPE ASSEMBLY
	8	GRAB RAILS AND RECESSED STEPS REFER: 12/SP1.08
	9	STANCHION POST AND ANCHOR REFER: 6/SP1.09
	10	TAGLINE POST AND ANCHOR REFER: 4/SP1.09
	11	UNDERWATER LIGHT REFER: 11/SP1.09
	12	DECK MOUNTED STARTING PLATFORM REFER: 2/SP1.09
	13	PARAPET MOUNTED STARTING PLATFORM REFER: 1/SP1.09
	14	BULKHEAD MOUNTED STARTING PLATFORM REFER: 5/SP1.09
	15	FLOATING WATER POLO GOAL REFER: 12/SP1.09
	16	POOL LIFT AND ANCHOR REFER: 13/SP1.08
	17	STANCHION POST AND ANCHOR @ BULKHEAD REFER: 3/SP1.09

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION
DOCUMENTS

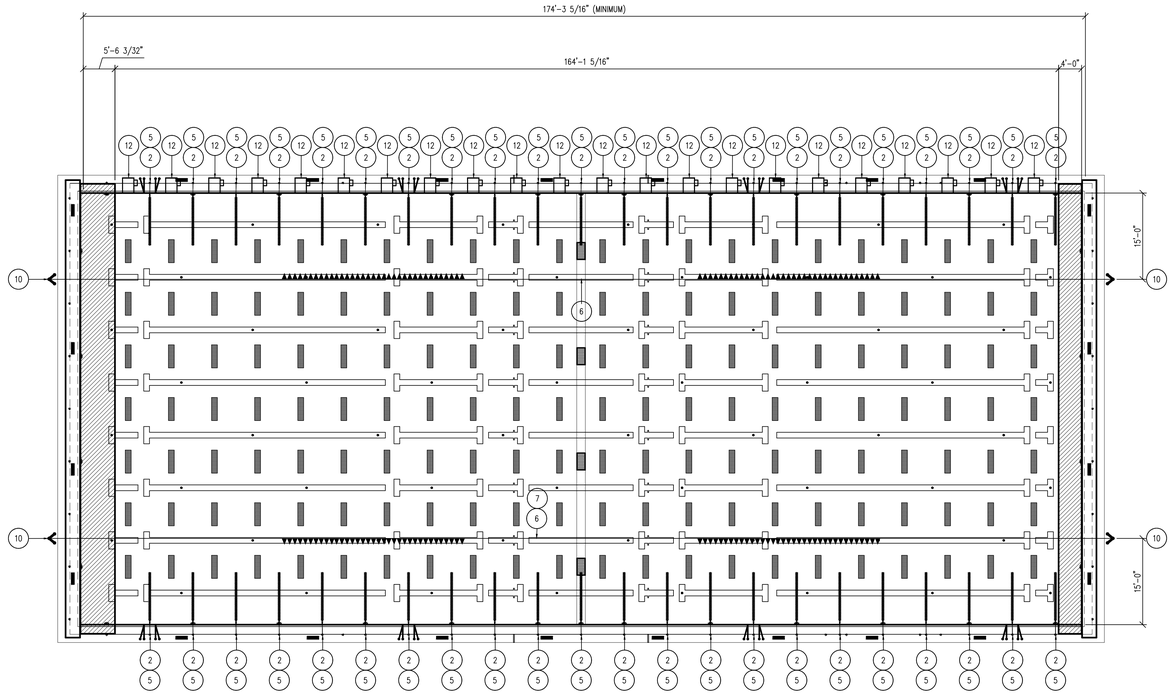
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

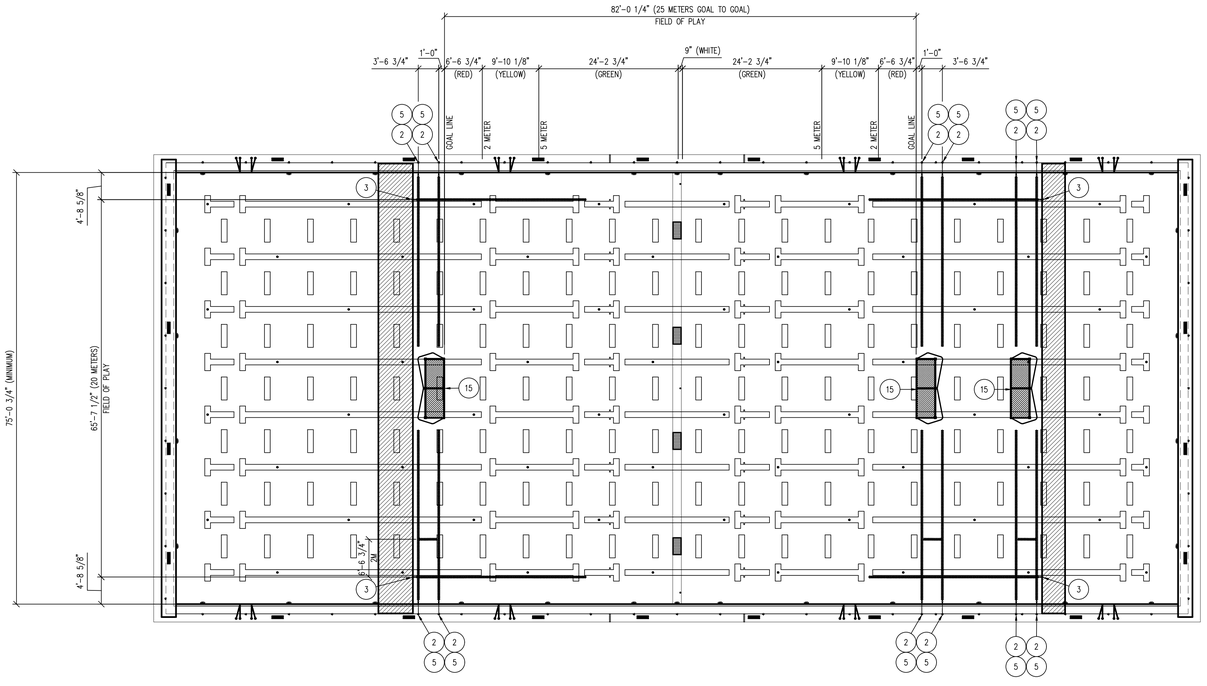
PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.03
COMPETITION POOL
COURSE LAYOUTS



1 SP1.04 **25 YARD CROSS COURSE LAYOUT**

3/32" = 1'-0"



2 SP1.04 **WATER POLO COMPETITION COURSE LAYOUT**

3/32" = 1'-0"

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR @ PARAPET REFER: 1/SP1.08
	2	LANE ROPE CUP ANCHOR @ ROLLOUT REFER: 2/SP1.08
	3	LANE ROPE CUP ANCHOR @ BULKHEAD REFER: 10/SP1.09
	4	LANE ROPE EXTENSION @ PARAPET REFER: 6/SP1.08
	5	LANE ROPE EXTENSION @ ROLLOUT REFER: 7/SP1.08
	6	BACKSTROKE PENNANT
	7	FALSE START ROPE ASSEMBLY
	8	GRAB RAILS AND RECESSED STEPS REFER: 12/SP1.08
	9	STANCHION POST AND ANCHOR REFER: 6/SP1.09
	10	TAGLINE POST AND ANCHOR REFER: 4/SP1.09
	11	UNDERWATER LIGHT REFER: 11/SP1.09
	12	DECK MOUNTED STARTING PLATFORM REFER: 2/SP1.09
	13	PARAPET MOUNTED STARTING PLATFORM REFER: 1/SP1.09
	14	BULKHEAD MOUNTED STARTING PLATFORM REFER: 5/SP1.09
	15	FLOATING WATER POLO GOAL REFER: 12/SP1.09
	16	POOL LIFT AND ANCHOR REFER: 13/SP1.08
	17	STANCHION POST AND ANCHOR @ BULKHEAD REFER: 3/SP1.09

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			

CONSTRUCTION DOCUMENTS

PROPOSED

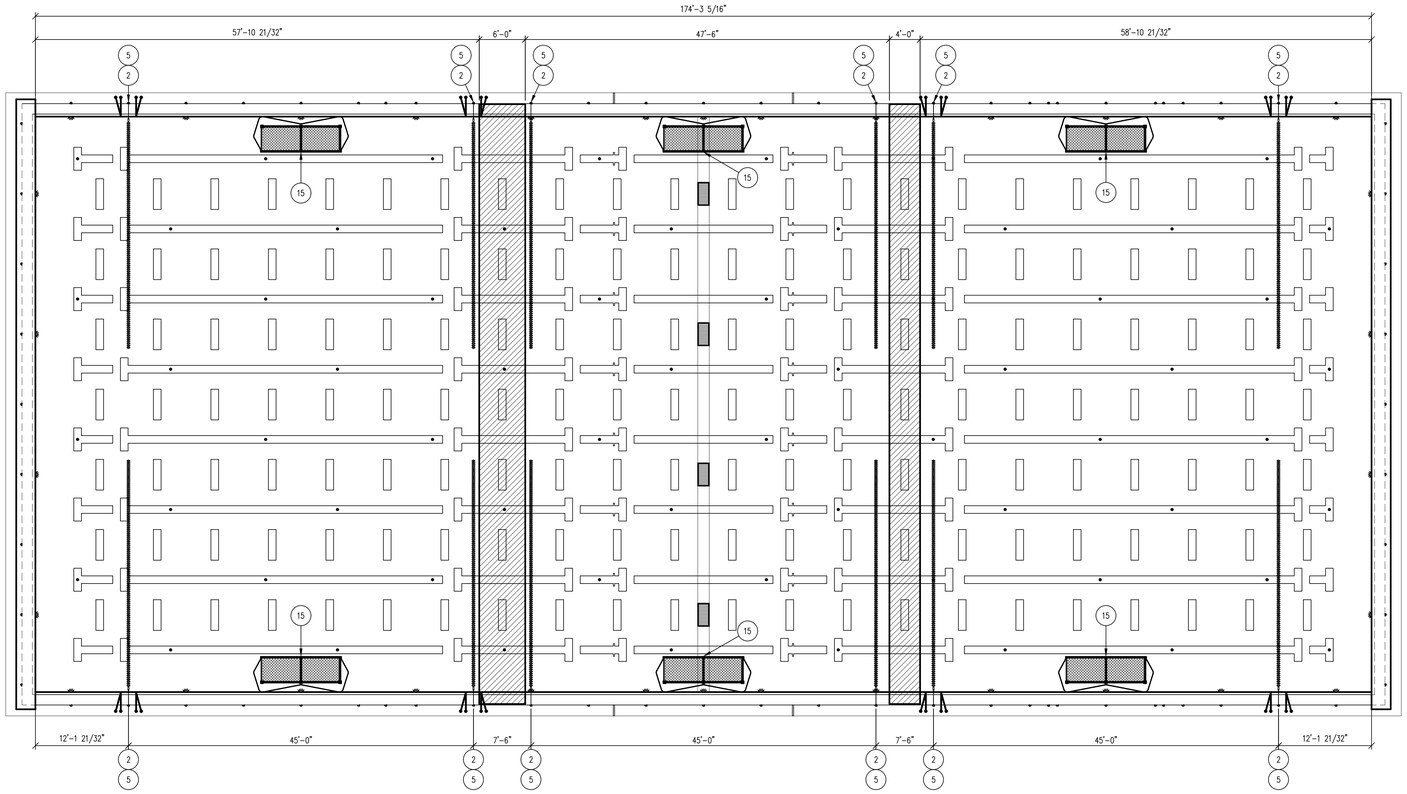
CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.04

COMPETITION POOL COURSE LAYOUTS



1 SP1.05 WATER POLO PRACTICE COURSE LAYOUT
1/8" = 1'-0"

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR @ PARAPET REFER: 1/SP1.08
	2	LANE ROPE CUP ANCHOR @ ROLLOUT REFER: 2/SP1.08
	3	LANE ROPE CUP ANCHOR @ BULKHEAD REFER: 10/SP1.09
	4	LANE ROPE EXTENSION @ PARAPET REFER: 6/SP1.08
	5	LANE ROPE EXTENSION @ ROLLOUT REFER: 7/SP1.08
	6	BACKSTROKE PENNANT
	7	FALSE START ROPE ASSEMBLY
	8	GRAB RAILS AND RECESSED STEPS REFER: 12/SP1.08
	9	STANCHION POST AND ANCHOR REFER: 6/SP1.09
	10	TAGLINE POST AND ANCHOR REFER: 4/SP1.09
	11	UNDERWATER LIGHT REFER: 11/SP1.09
	12	DECK MOUNTED STARTING PLATFORM REFER: 2/SP1.09
	13	PARAPET MOUNTED STARTING PLATFORM REFER: 1/SP1.09
	14	BULKHEAD MOUNTED STARTING PLATFORM REFER: 5/SP1.09
	15	FLOATING WATER POLO GOAL REFER: 12/SP1.09
	16	POOL LIFT AND ANCHOR REFER: 13/SP1.08
	17	STANCHION POST AND ANCHOR @ BULKHEAD REFER: 3/SP1.09

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION
DOCUMENTS

PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

SP1.05
COMPETITION POOL
COURSE LAYOUTS

CONSULT MANUFACTURERS SHOP DRAWINGS TO VERIFY POWER/DATA REQUIREMENTS, LOCATIONS AND QUANTITIES

1 1/2" CONDUIT (TYPICAL)

CONSULT MANUFACTURERS SHOP DRAWINGS TO VERIFY POWER/DATA REQUIREMENTS, LOCATIONS AND QUANTITIES

CONSULT MANUFACTURERS SHOP DRAWINGS TO VERIFY POWER/DATA REQUIREMENTS, LOCATIONS AND QUANTITIES

1 SP1.06 **COMPETITION POOL TIMING SYSTEM LAYOUT**
1/8" = 1'-0"

TIMING SYSTEM SCHEDULE

ID	QTY.	ITEM	DESCRIPTION
1	8	WALL PLATE	12X12X6 PVC JUNCTION BOX 18" AFF WITH 120 VAC QUAD OUTLET AND ETHERNET DROP BY OTHERS.
2	4	TDPI-S2 START DECK NODE	4X4X6 PVC JUNCTION BOX
3	43	TDPI TIMING DECK NODE	4X4X6 PVC JUNCTION BOX
4	3	TDPI-BH3 BULKHEAD DECK NODE	4X4X6 PVC JUNCTION BOX
5	2	TDPI-BH3 BULKHEAD CONNECTOR NODE	4X4X6 PVC JUNCTION BOX
6	4	4-DIGIT SLIM PACE CLOCK	

THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

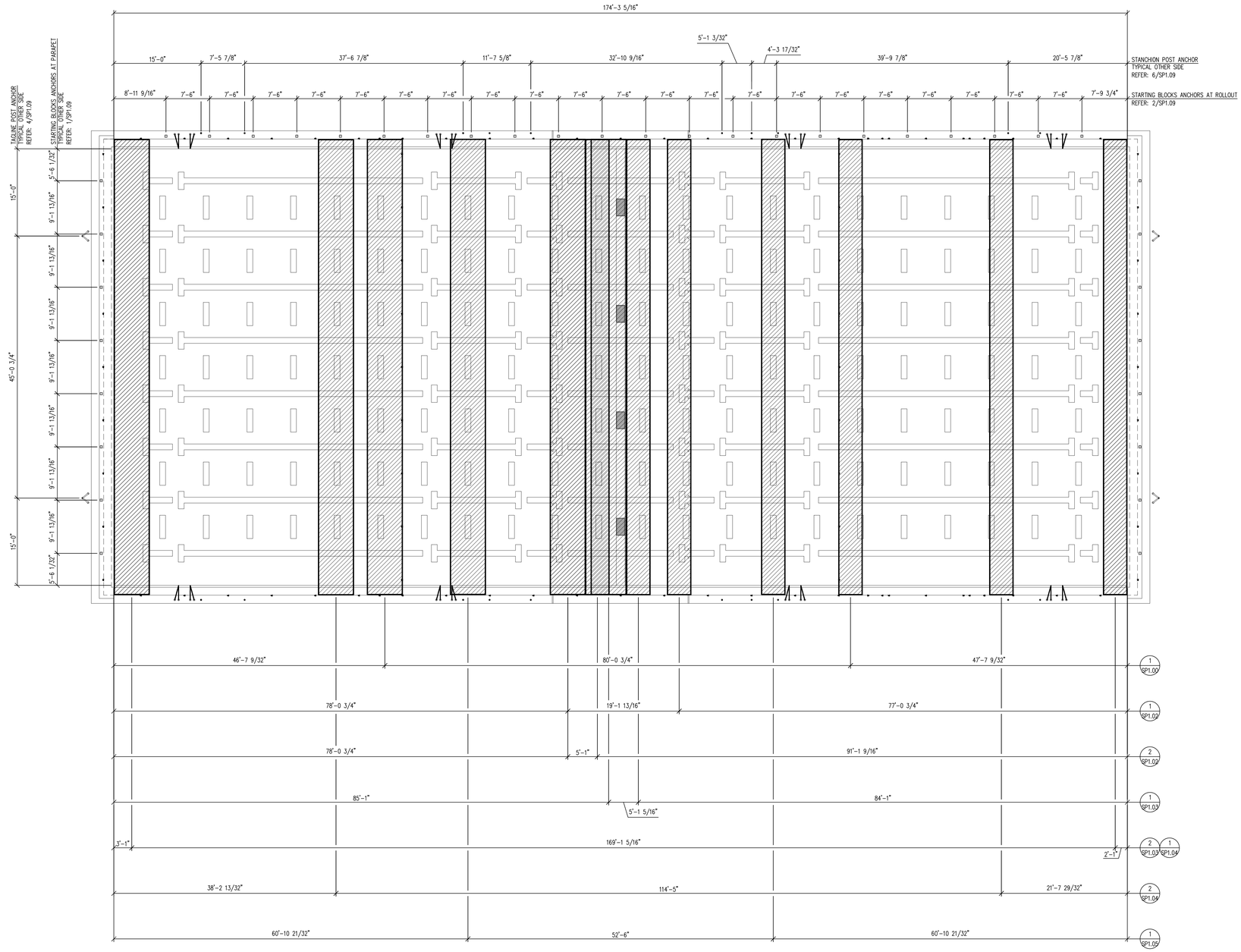
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.06
COMPETITION POOL TIMING SYSTEM LAYOUT



1 SP1.07 **BULKHEAD PARKING POSITION & DECK ANCHOR PLAN**

1/8" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION
DOCUMENTS

PROPOSED

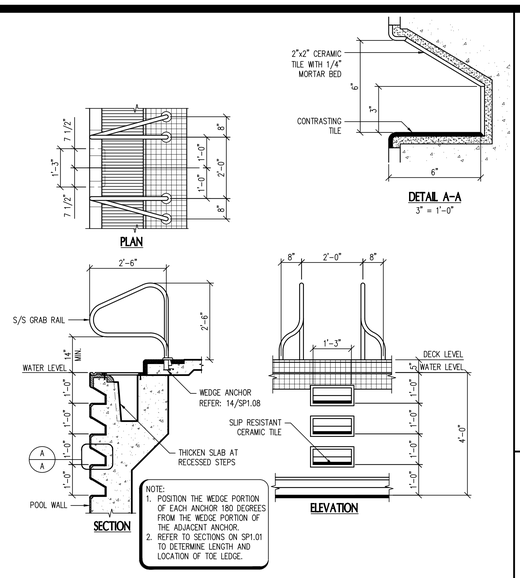
CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

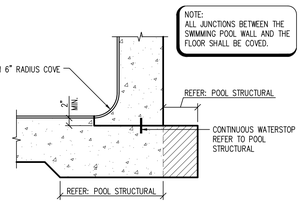
PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.07

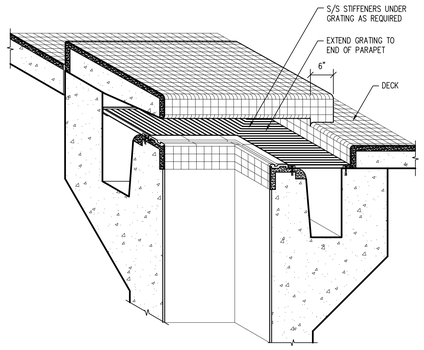
COMPETITION POOL
BULKHEAD PARKING PLAN



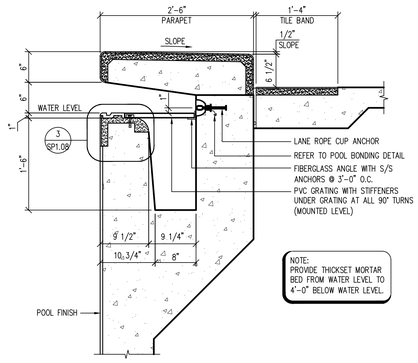
12 SP1.08 **GRAB RAILS & RECESSED STEPS**
1/2" = 1'-0"



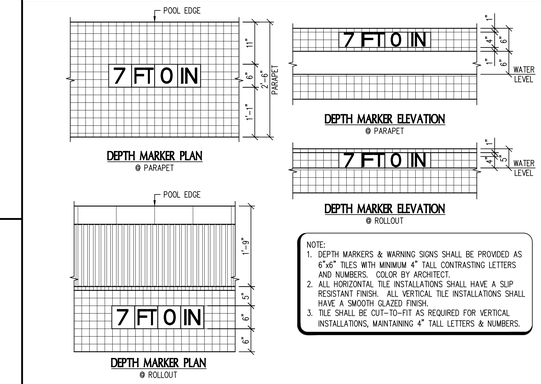
9 SP1.08 **SHOTCRETE COVE**
3/4" = 1'-0"



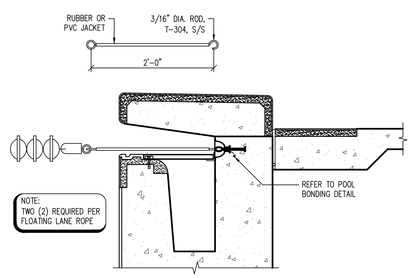
5 SP1.08 **PARAPET & ROLLOUT GUTTER INTERFACE**
3/4" = 1'-0"



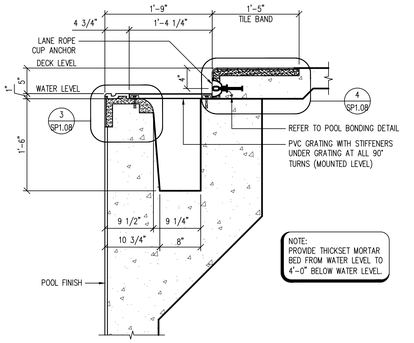
1 SP1.08 **CONCRETE PARAPET GUTTER**
1" = 1'-0"



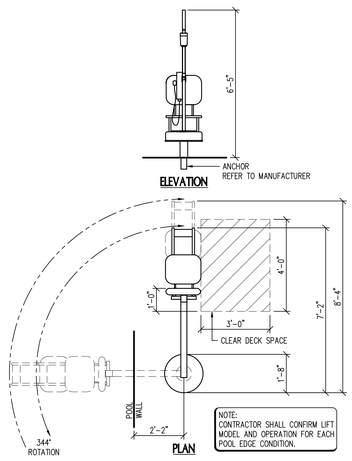
10 SP1.08 **DEPTH MARKERS**
3/4" = 1'-0"



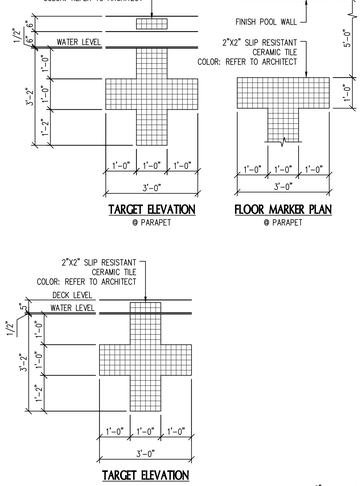
6 SP1.08 **LANE ROPE EXTENSION @ PARAPET**
1" = 1'-0"



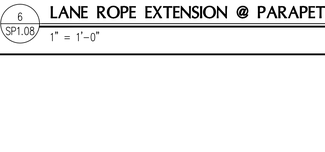
2 SP1.08 **CONCRETE ROLLOUT GUTTER**
1" = 1'-0"



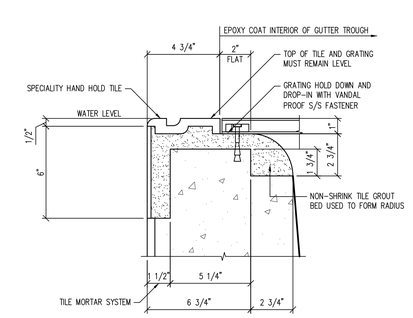
13 SP1.08 **POOL LIFT**
3/8" = 1'-0"



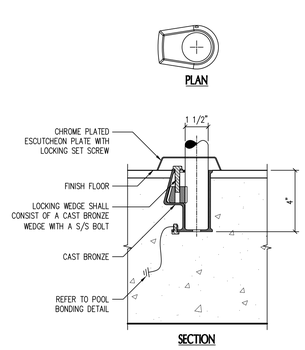
11 SP1.08 **WALL TARGETS & FLOOR MARKERS**
1/2" = 1'-0"



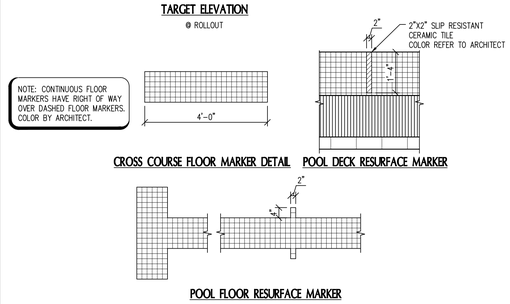
7 SP1.08 **LANE ROPE EXTENSION @ ROLLOUT**
1" = 1'-0"



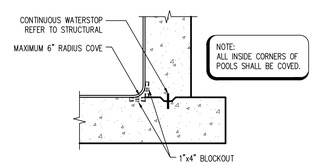
3 SP1.08 **GUTTER LIP**
3" = 1'-0"



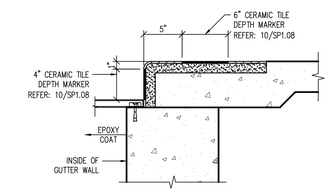
14 SP1.08 **WEDGE ANCHOR**
3" = 1'-0"



11 SP1.08 **WALL TARGETS & FLOOR MARKERS**
1/2" = 1'-0"



8 SP1.08 **CAST IN PLACE CONCRETE COVE**
3/4" = 1'-0"



4 SP1.08 **GUTTER CURB**
1 1/2" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

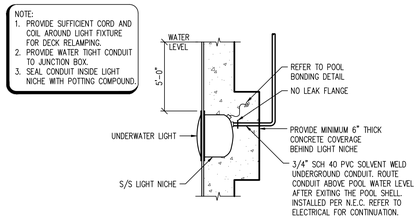
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

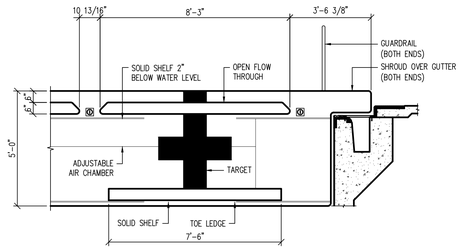
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

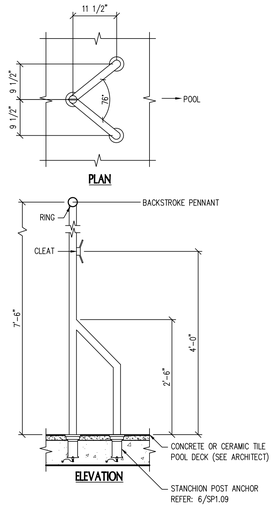
SP1.08
COMPETITION POOL DETAILS



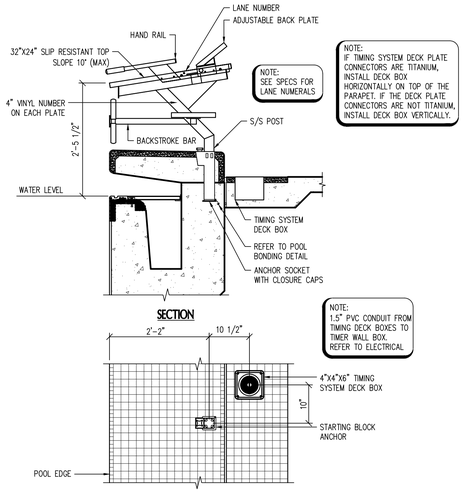
11 SP1.09 **UNDERWATER LIGHT**
3/4" = 1'-0"



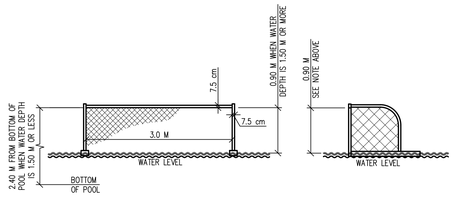
7 SP1.09 **ENLARGED BULKHEAD ELEVATION**
3/8" = 1'-0"



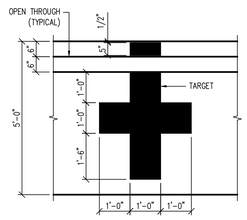
4 SP1.09 **TAGLINE STANCHION POST AND ANCHOR**
3/4" = 1'-0"



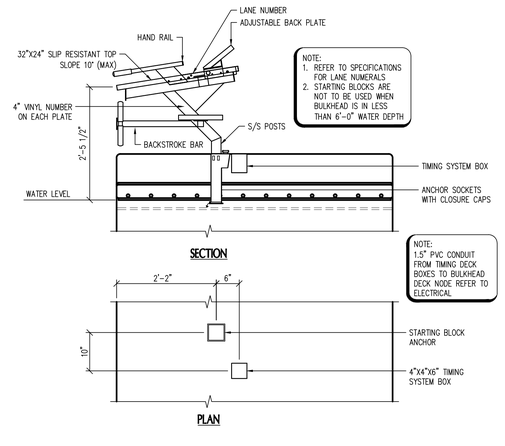
1 SP1.09 **STARTING BLOCK @ PARAPET**
3/4" = 1'-0"



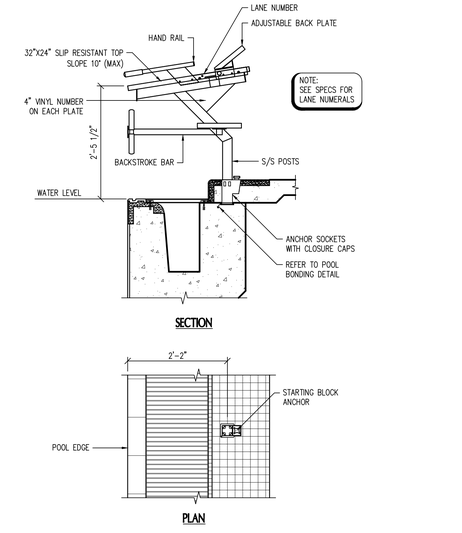
12 SP1.09 **FLOATING WATER POLO GOAL**
1/4" = 1'-0"



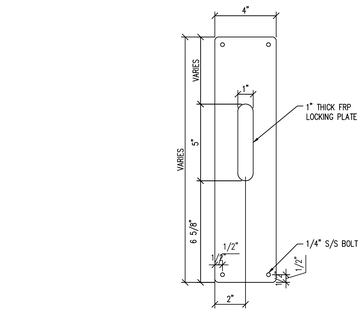
8 SP1.09 **BULKHEAD TARGET**
1/2" = 1'-0"



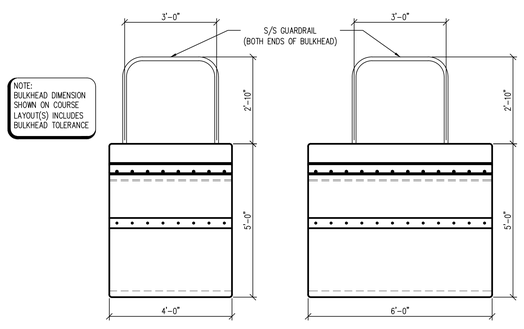
5 SP1.09 **BULKHEAD MOUNTED STARTING BLOCK**
3/4" = 1'-0"



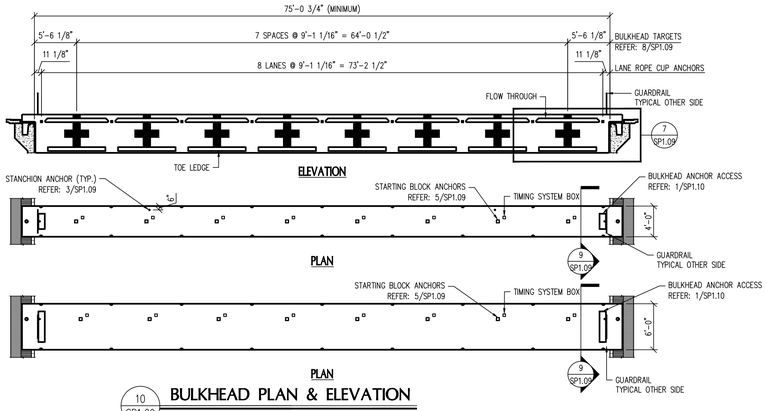
2 SP1.09 **STARTING BLOCK @ ROLLOUT**
3/4" = 1'-0"



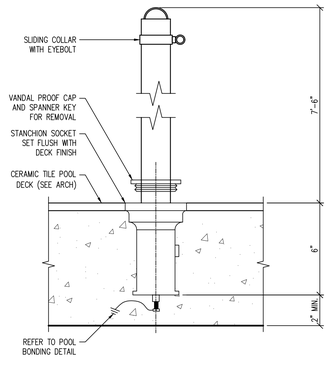
13 SP1.09 **BULKHEAD ANCHOR PLATE**
3" = 1'-0"



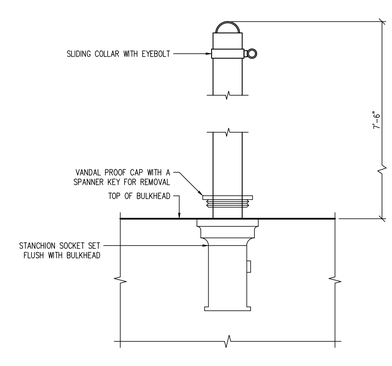
9 SP1.09 **BULKHEAD ELEVATION**
1/2" = 1'-0"



10 SP1.09 **BULKHEAD PLAN & ELEVATION**
1/8" = 1'-0"



6 SP1.09 **STANCHION POST AND ANCHOR**
3" = 1'-0"



3 SP1.09 **STANCHION POST & ANCHOR @ BULKHEAD**
3" = 1'-0"

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

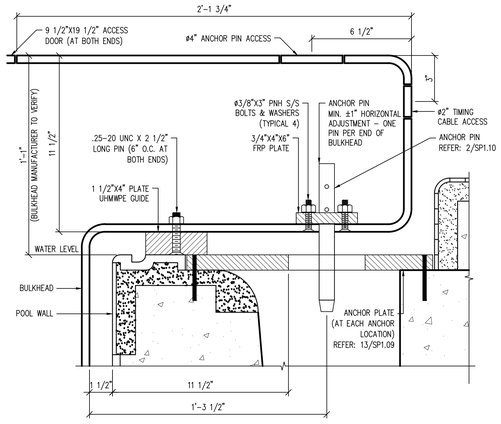
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

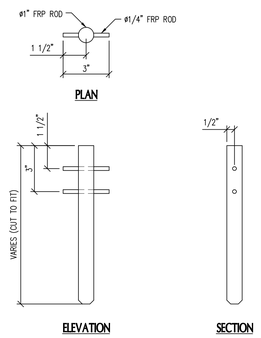
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP1.09
COMPETITION POOL DETAILS



1 SP1.10 **BULKHEAD ANCHOR**
3" = 1'-0"



2 SP1.10 **BULKHEAD ANCHOR PIN**
3" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			

CONSTRUCTION
DOCUMENTS

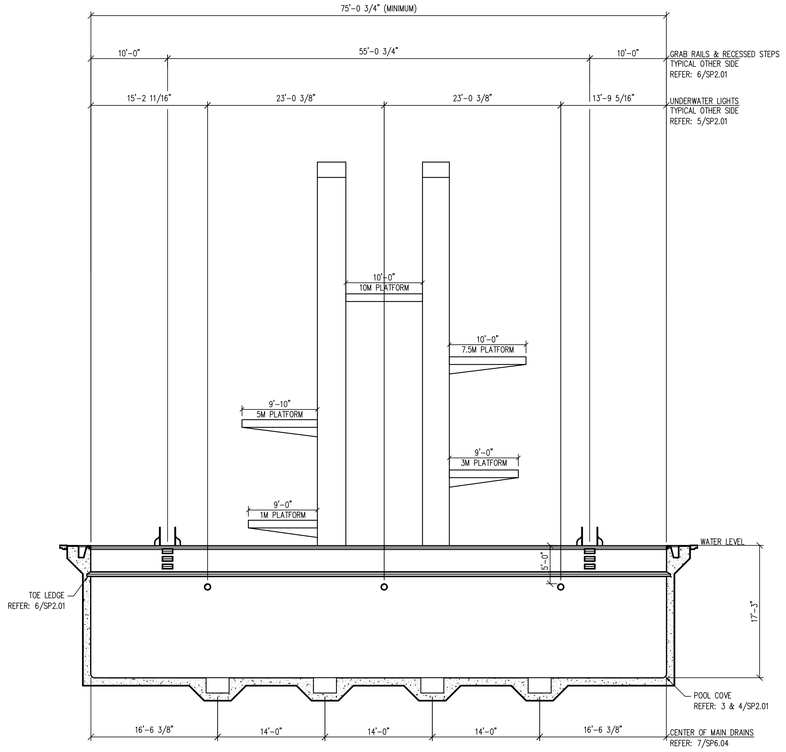
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

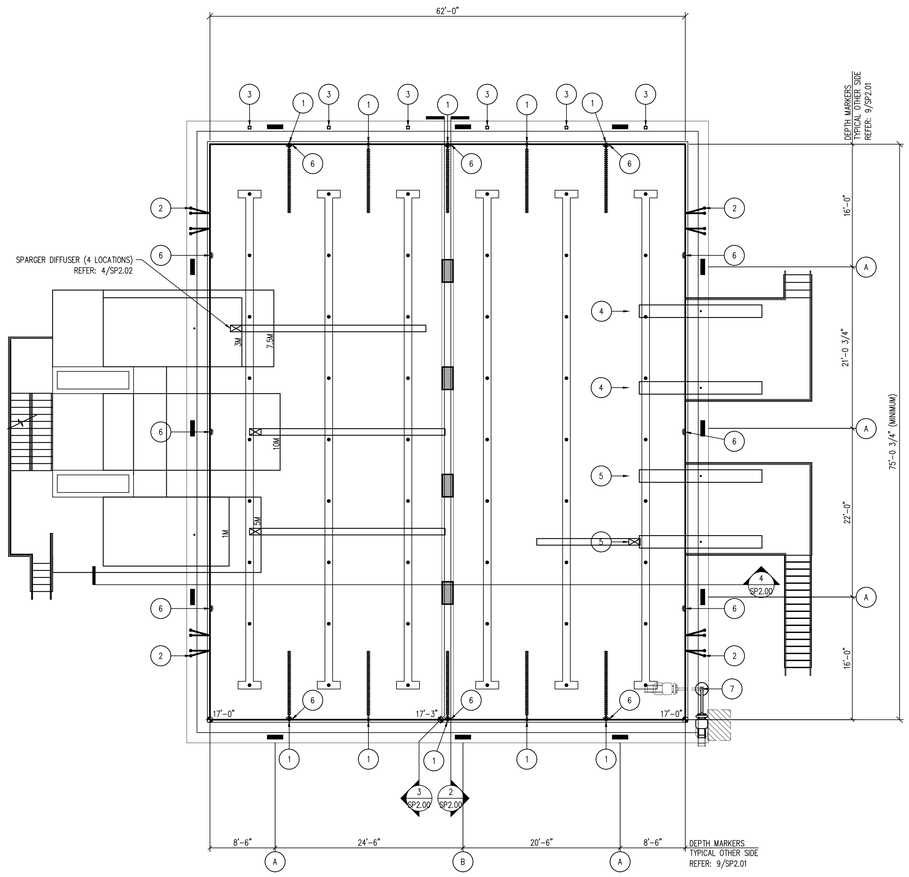
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	071805
DATE	06/07/2019
REVISED	

SP1.10
COMPETITION POOL DETAILS



3 SP2.00 **DIVE POOL SECTION**
1/8" = 1'-0"



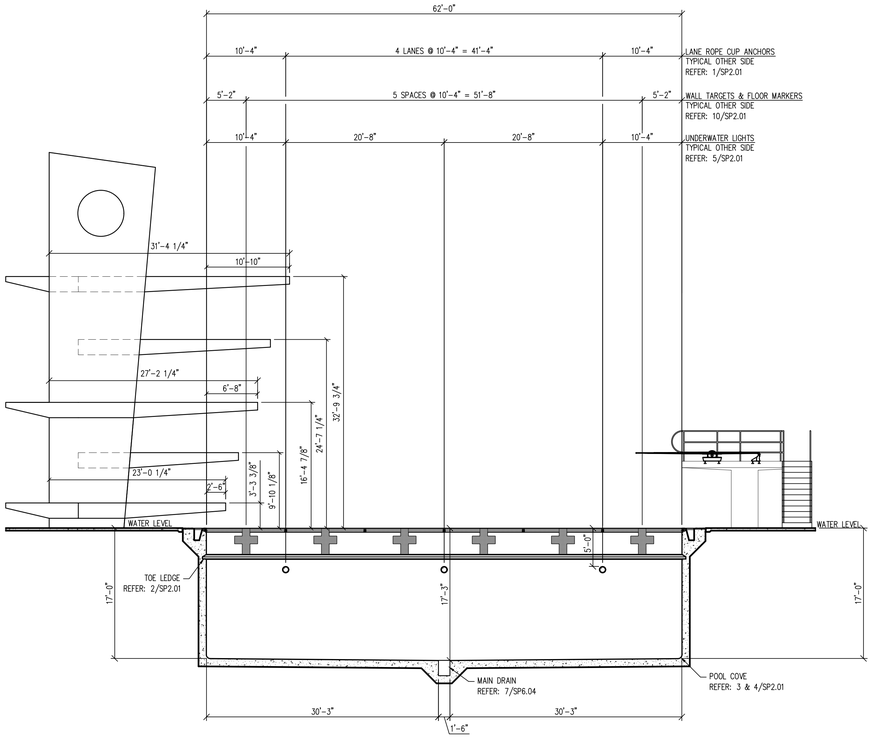
1 SP2.00 **DIVE POOL PLAN**
1/8" = 1'-0"

DEPTH MARKER SIGNAGE SCHEDULE

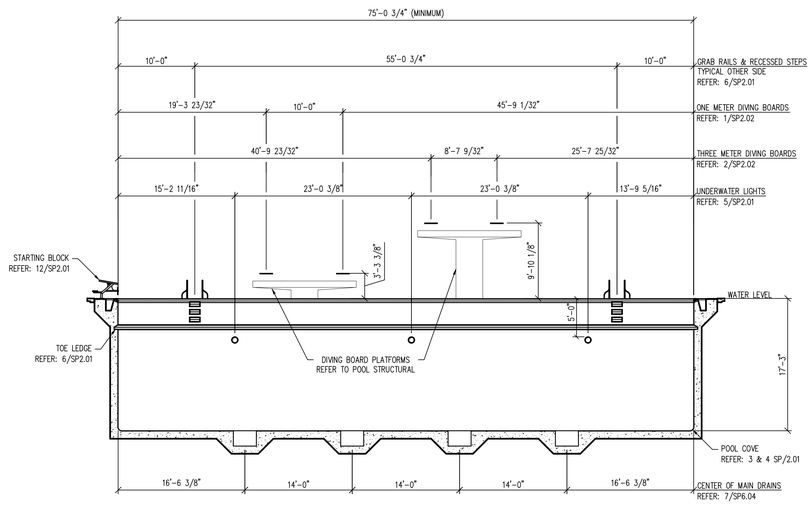
ID	SIGNAGE
A	17 FT 0 IN
B	17 FT 3 IN

POOL EQUIPMENT LEGEND

LEGEND	ID	ITEM
	1	LANE ROPE CUP ANCHOR REFER: 1/SP2.01
	2	GRAB RAILS AND RECESSED STEPS REFER: 6/SP2.01
	3	STARTING PLATFORM ANCHOR ONLY REFER: 12/SP2.01
	4	ONE METER DIVING SPRINGBOARD AND MOUNT REFER: 1/SP2.02
	5	THREE METER DIVING SPRINGBOARD AND MOUNT REFER: 2/SP2.02
	6	UNDERWATER LIGHT REFER: 5/SP2.01
	7	POOL LIFT AND ANCHOR REFER: 13/SP2.01



4 SP2.00 **DIVE POOL SECTION**
1/8" = 1'-0"



2 SP2.00 **DIVE POOL SECTION**
1/8" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION
DOCUMENTS

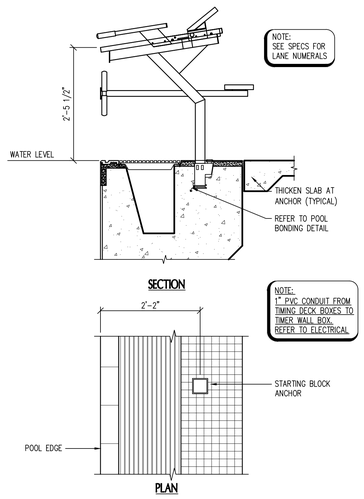
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

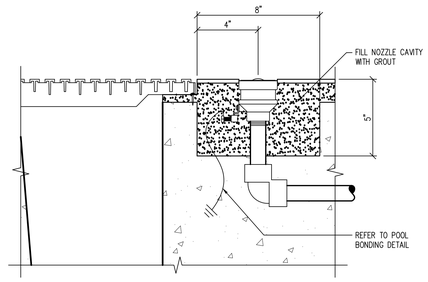
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

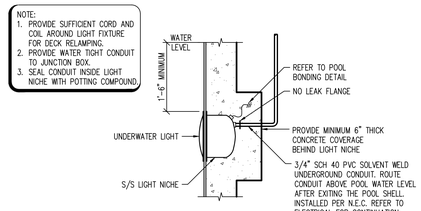
SP2.00
DIVE POOL PLAN & SECTIONS



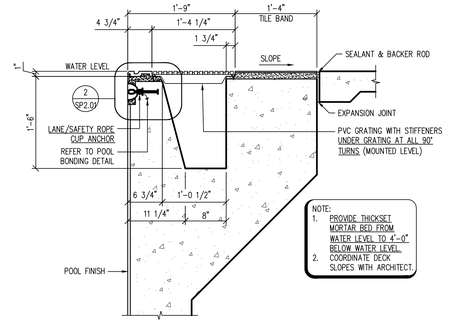
12 SP2.01 **STARTING BLOCK (ANCHOR ONLY)**
3/4" = 1'-0"



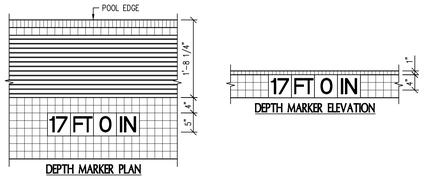
7 SP2.01 **WATER SURFACE AGITATOR**
6" = 1'-0"



5 SP2.01 **UNDERWATER LIGHT**
3/4" = 1'-0"

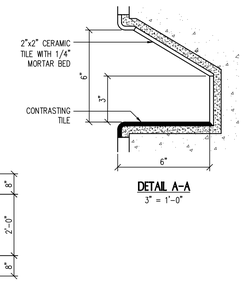


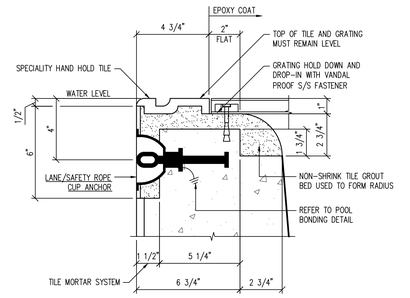
1 SP2.01 **CONCRETE DECK LEVEL GUTTER**
1" = 1'-0"



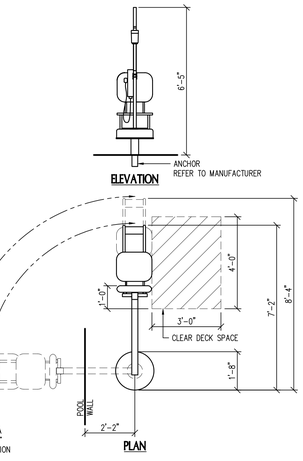
NOTE:
1. DEPTH MARKERS & WARNING SIGNS SHALL BE PROVIDED AS 6"x6" TILES WITH MINIMUM 4" TALL CONTRASTING LETTERS AND NUMBERS. COLOR BY ARCHITECT.
2. PROVIDE NO DIVING WARNING SIGNS WITH 6"x6" TILE DISPLAYING INTERNATIONAL NO DIVING SYMBOL.
3. ALL HORIZONTAL TILE INSTALLATIONS SHALL HAVE A SLIP RESISTANT FINISH. ALL VERTICAL TILE INSTALLATIONS SHALL HAVE A SMOOTH GLAZED FINISH.
4. TILE SHALL BE CUT-TO-FIT AS REQUIRED FOR VERTICAL INSTALLATIONS, MAINTAINING 4" TALL LETTERS & NUMBERS.

9 SP2.01 **DEPTH MARKERS & WARNING SIGNS**
3/4" = 1'-0"

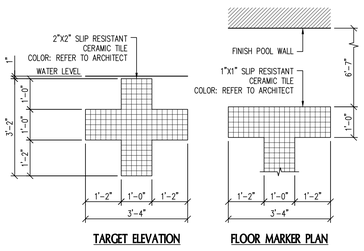




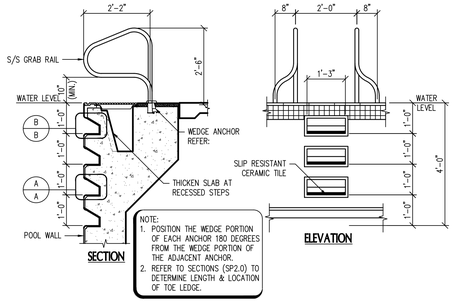
2 SP2.01 **GUTTER LIP**
3" = 1'-0"



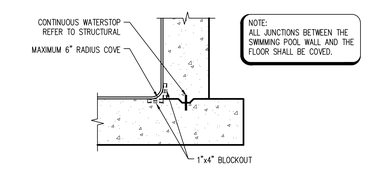
13 SP2.01 **POOL LIFT**
3/8" = 1'-0"



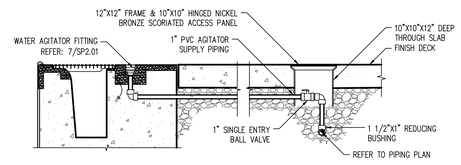
10 SP2.01 **WALL TARGETS & FLOOR MARKERS**
1/2" = 1'-0"



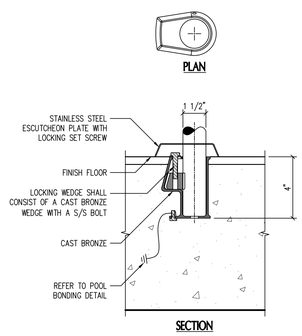
6 SP2.01 **GRAB RAILS & RECESSED STEPS**
1/2" = 1'-0"



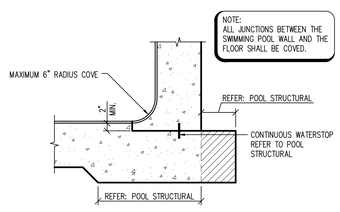
3 SP2.01 **CAST IN PLACE CONCRETE COVE**
3/4" = 1'-0"



11 SP2.01 **WATER AGITATOR PIPING**
3/4" = 1'-0"



7 SP2.01 **WEDGE ANCHOR**
3" = 1'-0"



4 SP2.01 **SHOTCRETE COVE**
3/4" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION
DOCUMENTS

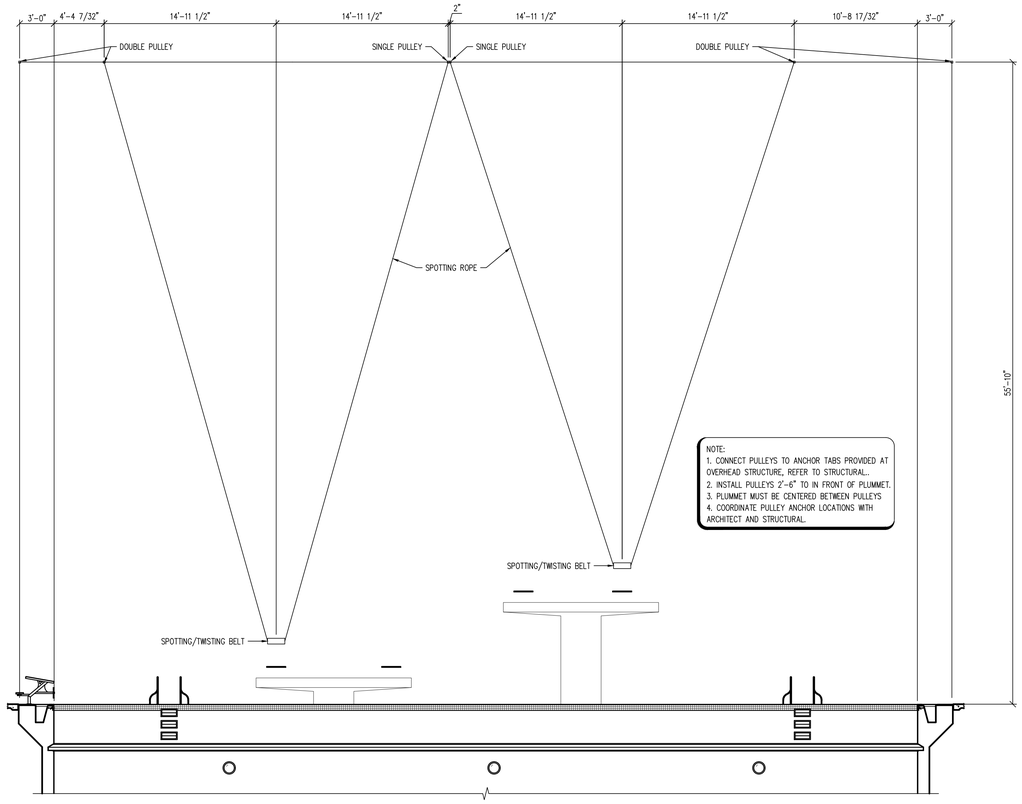
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

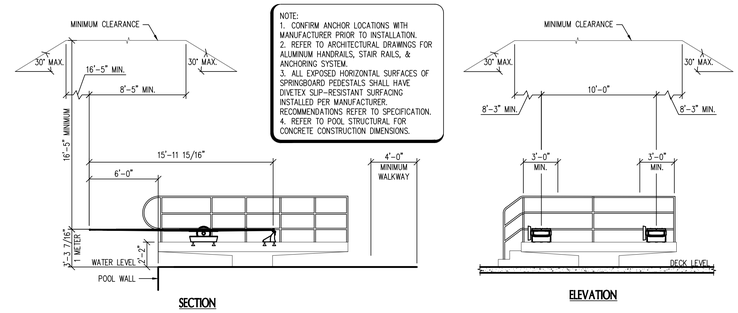
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP2.01
DIVE POOL DETAILS



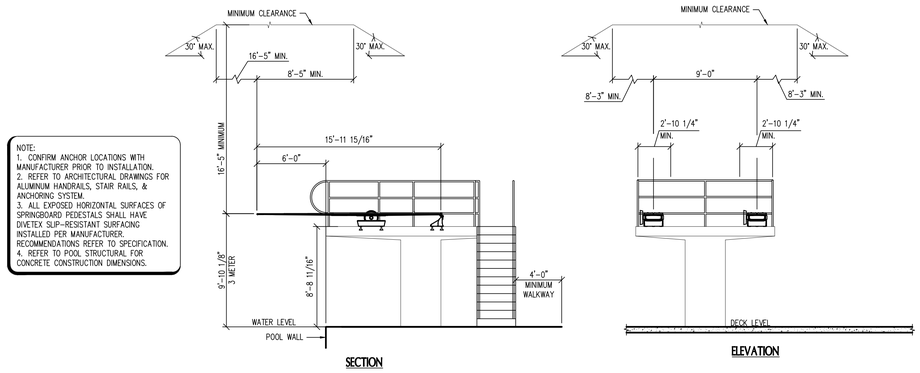
5 SP2.02 **DIVING HARNESS FRONT ELEVATION**
3/16" = 1'-0"



SECTION

ELEVATION

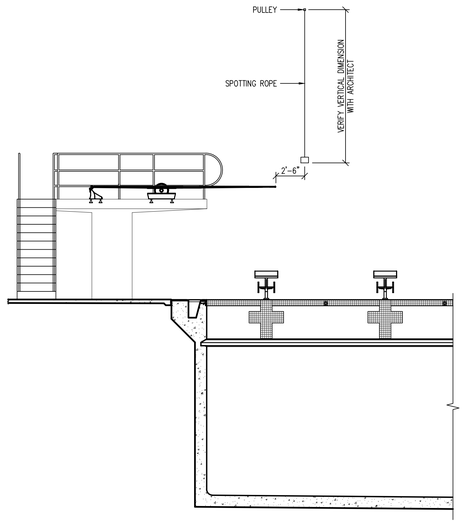
1 SP2.02 **ONE METER DIVING SUPPORT**
3/16" = 1'-0"



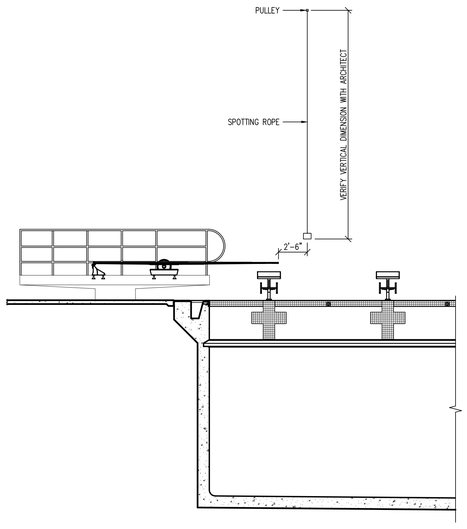
SECTION

ELEVATION

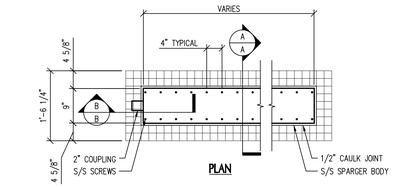
2 SP2.02 **THREE METER DIVING SUPPORT**
3/16" = 1'-0"



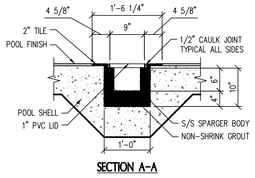
7 SP2.02 **THREE METER DIVING HARNESS SIDE ELEVATION**
3/16"=1'-0"



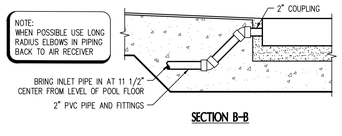
6 SP2.02 **ONE METER DIVING HARNESS SIDE ELEVATION**
3/16"=1'-0"



PLAN

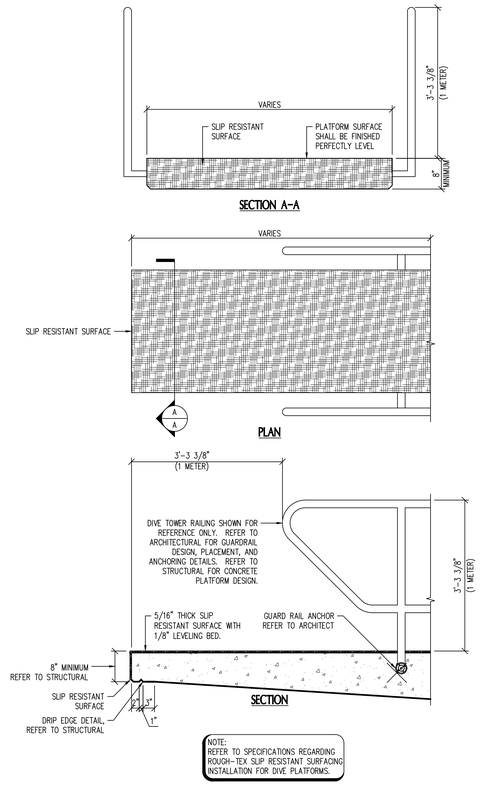


SECTION A-A



SECTION B-B

4 SP2.02 **SPARGER PLAN AND SECTIONS**
3/4" = 1'-0"



SECTION

3 SP2.02 **PLATFORM EDGE**
3/4" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

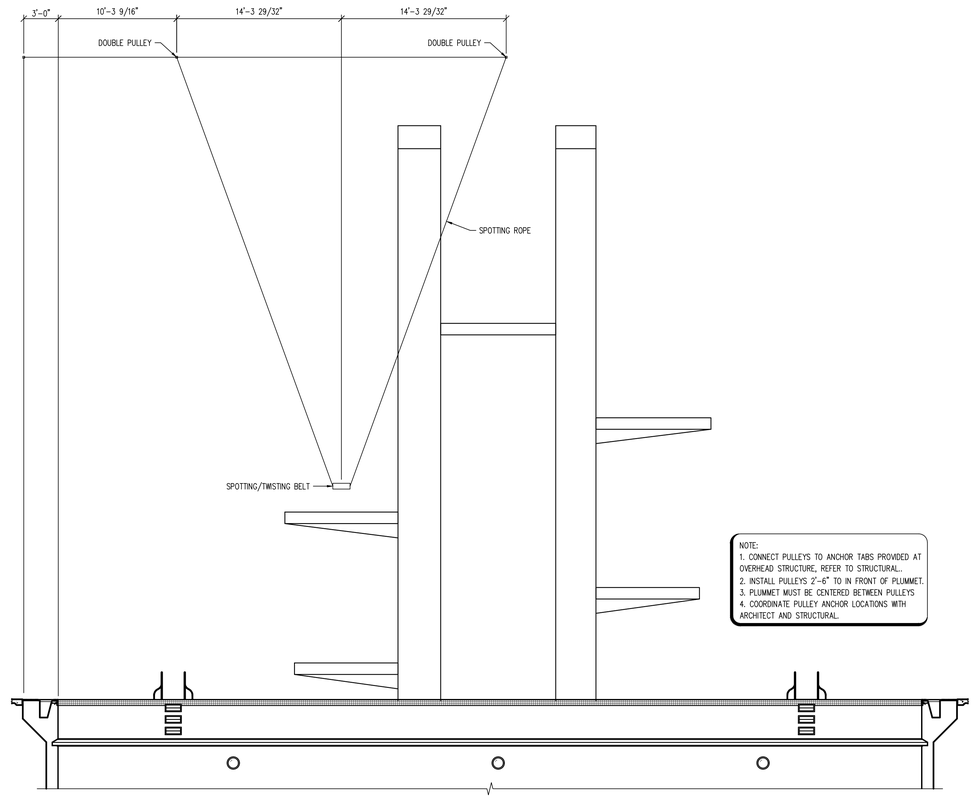
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

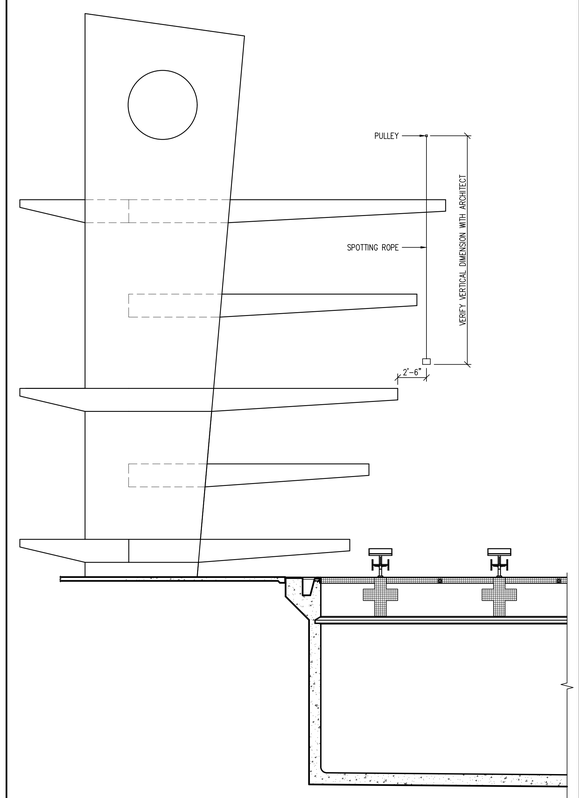
PROJECT	971805
DATE	06/07/2019
REVISED	

SP2.02
DIVE POOL DETAILS



1 SP2.03 DIVING HARNESS FRONT ELEVATION – 5M PLATFORM

3/16" = 1'-0"



2 SP2.03 DIVING HARNES SIDE ELEVATION – 5M PLATFORM

3/16"=1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION DOCUMENTS

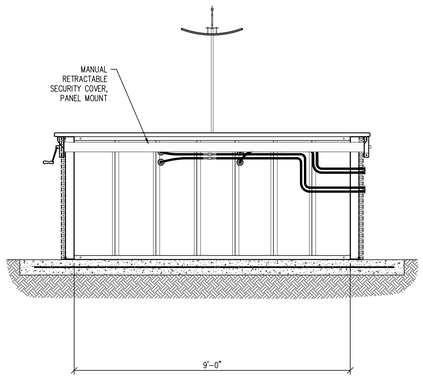
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

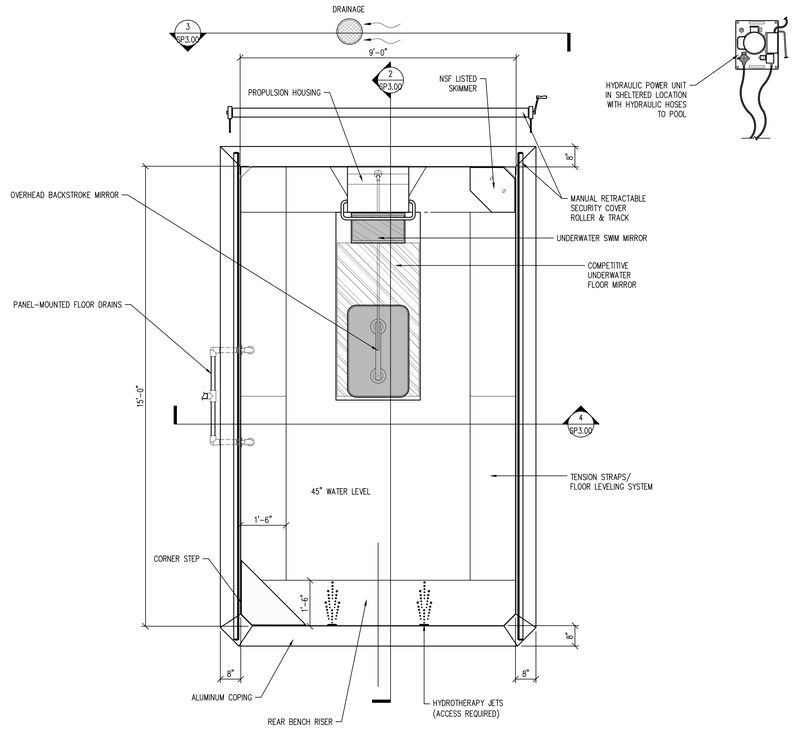
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

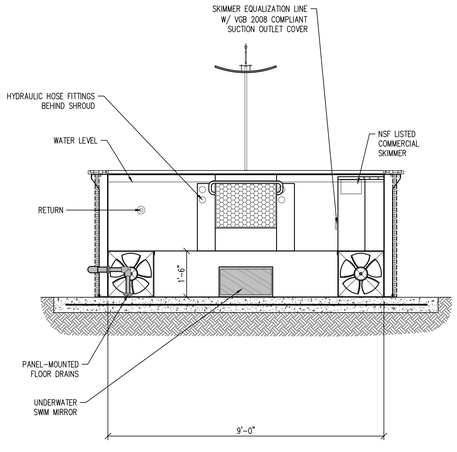
SP2.03
DIVE POOL DETAILS



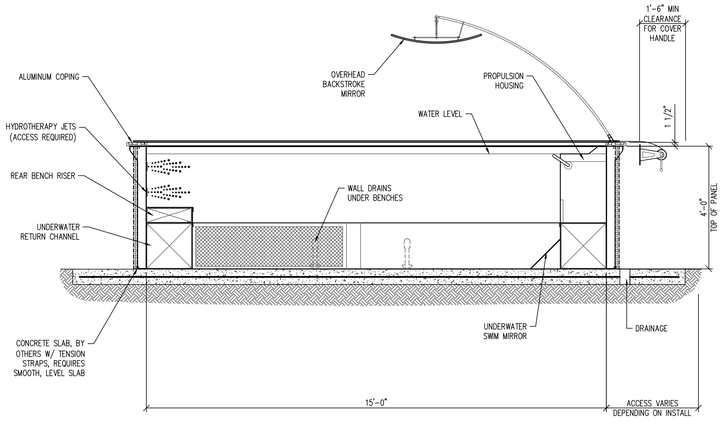
3 SP3.00 **ENDLESS POOL SECTION**
1/2" = 1'-0"



1 SP3.00 **ENDLESS POOL PLAN**
1/2" = 1'-0"



4 SP3.00 **ENDLESS POOL SECTION**
1/2" = 1'-0"



2 SP3.00 **ENDLESS POOL SECTION**
1/2" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			

CONSTRUCTION
DOCUMENTS

PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP3.00
ENDLESS POOL PLAN &
SECTIONS (ALTERNATE #2)

ENDLESS POOL LOCATION POINT SCHEDULE

LP#	X	Y	DESCRIPTION
1	14'-3 1/2"	81'-6 3/4"	CONSTRUCTION POINT
2	24'-7"	81'-6 3/4"	CONSTRUCTION POINT
3	24'-7"	65'-10 1/2"	CONSTRUCTION POINT
4	23'-11 3/4"	65'-3 1/4"	CONSTRUCTION POINT
5	14'-10 3/4"	65'-3 1/4"	CONSTRUCTION POINT
6	14'-3 1/2"	65'-10 1/2"	CONSTRUCTION POINT

DIVE POOL LOCATION POINT SCHEDULE

LP#	X	Y	DESCRIPTION
1	34'-9 1/2"	78'-0"	CONSTRUCTION POINT
2	96'-9 1/2"	78'-0"	CONSTRUCTION POINT
3	34'-9 1/2"	2'-11 1/4"	CONSTRUCTION POINT
4	96'-9 1/2"	2'-11 1/4"	CONSTRUCTION POINT
5	65'-9 1/2"	61'-5 3/4"	CENTER OF MAIN DRAIN
6	65'-9 1/2"	47'-5 3/4"	CENTER OF MAIN DRAIN
7	65'-9 1/2"	33'-5 3/4"	CENTER OF MAIN DRAIN
8	65'-9 1/2"	19'-5 3/4"	CENTER OF MAIN DRAIN
9	65'-9 1/2"	79'-8 1/4"	GUTTER DROPOUT BOX
10	98'-5 3/4"	40'-5 3/4"	GUTTER DROPOUT BOX
11	65'-9 1/2"	1'-3"	GUTTER DROPOUT BOX
12	33'-1 1/4"	40'-5 3/4"	GUTTER DROPOUT BOX
13	39'-11 1/2"	71'-6"	FLOOR INLET
14	39'-11 1/2"	63'-6"	FLOOR INLET
15	39'-11 1/2"	55'-5 3/4"	FLOOR INLET
16	39'-11 1/2"	47'-5 3/4"	FLOOR INLET
17	39'-11 1/2"	39'-5 3/4"	FLOOR INLET
18	39'-11 1/2"	31'-5 1/2"	FLOOR INLET
19	39'-11 1/2"	23'-5 1/2"	FLOOR INLET
20	39'-11 1/2"	15'-5 1/2"	FLOOR INLET
21	39'-11 1/2"	7'-5 1/4"	FLOOR INLET
22	50'-3 1/2"	7'-5 1/4"	FLOOR INLET
23	50'-3 1/2"	15'-5 1/2"	FLOOR INLET
24	50'-3 1/2"	23'-5 1/2"	FLOOR INLET
25	50'-3 1/2"	31'-5 1/2"	FLOOR INLET
26	50'-3 1/2"	39'-5 3/4"	FLOOR INLET
27	50'-3 1/2"	47'-5 3/4"	FLOOR INLET
28	50'-3 1/2"	55'-5 3/4"	FLOOR INLET
29	50'-3 1/2"	63'-6"	FLOOR INLET
30	50'-3 1/2"	71'-6"	FLOOR INLET
31	60'-7 1/2"	71'-6"	FLOOR INLET
32	60'-7 1/2"	63'-6"	FLOOR INLET
33	60'-7 1/2"	55'-5 3/4"	FLOOR INLET
34	60'-7 1/2"	47'-5 3/4"	FLOOR INLET
35	60'-7 1/2"	39'-5 3/4"	FLOOR INLET
36	60'-7 1/2"	31'-5 1/2"	FLOOR INLET
37	60'-7 1/2"	23'-5 1/2"	FLOOR INLET
38	60'-7 1/2"	15'-5 1/2"	FLOOR INLET
39	60'-7 1/2"	7'-5 1/4"	FLOOR INLET
40	70'-11 1/2"	7'-5 1/4"	FLOOR INLET
41	70'-11 1/2"	15'-5 1/2"	FLOOR INLET
42	70'-11 1/2"	23'-5 1/2"	FLOOR INLET
43	70'-11 1/2"	31'-5 1/2"	FLOOR INLET
44	70'-11 1/2"	39'-5 3/4"	FLOOR INLET
45	70'-11 1/2"	47'-5 3/4"	FLOOR INLET
46	70'-11 1/2"	55'-5 3/4"	FLOOR INLET
47	70'-11 1/2"	63'-6"	FLOOR INLET
48	70'-11 1/2"	71'-6"	FLOOR INLET
49	81'-3 1/2"	71'-6"	FLOOR INLET
50	81'-3 1/2"	61'-6"	FLOOR INLET
51	81'-3 1/2"	55'-5 3/4"	FLOOR INLET
52	81'-3 1/2"	47'-5 3/4"	FLOOR INLET
53	81'-3 1/2"	39'-5 3/4"	FLOOR INLET
54	81'-3 1/2"	31'-5 1/2"	FLOOR INLET
55	81'-3 1/2"	23'-5 1/2"	FLOOR INLET
56	81'-3 1/2"	15'-5 1/2"	FLOOR INLET
57	81'-3 1/2"	7'-5 1/4"	FLOOR INLET
58	91'-7 1/2"	7'-5 1/4"	FLOOR INLET
59	91'-7 1/2"	15'-5 1/2"	FLOOR INLET
60	91'-7 1/2"	23'-5 1/2"	FLOOR INLET
61	91'-7 1/2"	31'-5 1/2"	FLOOR INLET
62	91'-7 1/2"	39'-5 3/4"	FLOOR INLET
63	91'-7 1/2"	47'-5 3/4"	FLOOR INLET
64	91'-7 1/2"	55'-5 3/4"	FLOOR INLET
65	91'-7 1/2"	63'-6"	FLOOR INLET
66	91'-7 1/2"	71'-6"	FLOOR INLET
67	67'-11"	89'-7 1/4"	SIGHT SUMP
68	7'-6 1/2"	53'-11 3/4"	AGITATOR BOX
69	7'-6 1/2"	40'-5 3/4"	AGITATOR BOX
70	7'-6 1/2"	27'-0 3/4"	AGITATOR BOX
71	114'-1 3/4"	56'-2 3/4"	AGITATOR BOX
72	114'-1 3/4"	46'-2 3/4"	AGITATOR BOX
73	114'-1 3/4"	34'-8 3/4"	AGITATOR BOX
74	114'-1 3/4"	26'-1 3/4"	AGITATOR BOX
75	32'-9 1/4"	53'-11 3/4"	AGITATOR FITTING
76	32'-9 1/4"	40'-5 3/4"	AGITATOR FITTING
77	32'-9 1/4"	27'-0 3/4"	AGITATOR FITTING
78	98'-9 3/4"	56'-2 3/4"	AGITATOR FITTING
79	98'-9 3/4"	46'-2 3/4"	AGITATOR FITTING
80	98'-9 3/4"	34'-8 3/4"	AGITATOR FITTING
81	98'-9 3/4"	26'-1 3/4"	AGITATOR FITTING
82	38'-2 1/2"	53'-11 3/4"	SPARGER
83	40'-8 1/2"	40'-5 3/4"	SPARGER
84	40'-8 1/2"	27'-5 3/4"	SPARGER
85	90'-2"	26'-1 3/4"	SPARGER
86	45'-1 1/2"	78'-0"	LANE ROPE CUP ANCHOR
87	55'-5 1/2"	78'-0"	LANE ROPE CUP ANCHOR
88	65'-9 1/2"	78'-0"	LANE ROPE CUP ANCHOR
89	76'-1 1/2"	78'-0"	LANE ROPE CUP ANCHOR
90	86'-5 1/2"	78'-0"	LANE ROPE CUP ANCHOR
91	45'-1 1/2"	2'-11 1/4"	LANE ROPE CUP ANCHOR
92	55'-5 1/2"	2'-11 1/4"	LANE ROPE CUP ANCHOR
93	65'-9 1/2"	2'-11 1/4"	LANE ROPE CUP ANCHOR
94	76'-1 1/2"	2'-11 1/4"	LANE ROPE CUP ANCHOR
95	86'-5 1/2"	2'-11 1/4"	LANE ROPE CUP ANCHOR
96	39'-11 1/2"	80'-2"	STARTING BLOCK ANCHOR
97	50'-3 1/2"	80'-2"	STARTING BLOCK ANCHOR
98	60'-7 1/2"	80'-2"	STARTING BLOCK ANCHOR
99	70'-11 1/2"	80'-2"	STARTING BLOCK ANCHOR
100	81'-3 1/2"	80'-2"	STARTING BLOCK ANCHOR
101	91'-7 1/2"	80'-2"	STARTING BLOCK ANCHOR
102	45'-1 1/2"	78'-0"	UNDERWATER LIGHT
103	65'-9 1/2"	78'-0"	UNDERWATER LIGHT
104	86'-5 1/2"	78'-0"	UNDERWATER LIGHT
105	96'-9 1/2"	61'-6"	UNDERWATER LIGHT
106	96'-9 1/2"	40'-5 3/4"	UNDERWATER LIGHT
107	96'-9 1/2"	17'-5 1/4"	UNDERWATER LIGHT
108	86'-5 1/2"	2'-11 1/4"	UNDERWATER LIGHT
109	65'-9 1/2"	2'-11 1/4"	UNDERWATER LIGHT
110	45'-1 1/2"	2'-11 1/4"	UNDERWATER LIGHT
111	34'-9 1/2"	17'-5 1/4"	UNDERWATER LIGHT
112	34'-9 1/2"	40'-5 3/4"	UNDERWATER LIGHT
113	34'-9 1/2"	63'-6"	UNDERWATER LIGHT
114	34'-9 1/2"	68'-0"	GRAB RAILS & RECESSED STEPS
115	34'-9 1/2"	12'-11 1/4"	GRAB RAILS & RECESSED STEPS
116	96'-9 1/2"	68'-0"	GRAB RAILS & RECESSED STEPS
117	96'-9 1/2"	12'-11 1/4"	GRAB RAILS & RECESSED STEPS
118	98'-11 1/2"	6'-11 1/4"	POOL LIFT ANCHOR

COMPETITION POOL LOCATION POINT SCHEDULE

LP#	X	Y	DESCRIPTION
1	-10'-9 3/4"	-24'-9"	CONSTRUCTION POINT
2	163'-5 3/4"	-24'-9"	CONSTRUCTION POINT
3	163'-5 3/4"	-99'-9 3/4"	CONSTRUCTION POINT
4	-10'-9 3/4"	-99'-9 3/4"	CONSTRUCTION POINT
5	76'-4"	-34'-10"	CENTER OF MAIN DRAIN
6	76'-4"	-53'-1 1/2"	CENTER OF MAIN DRAIN
7	76'-4"	-71'-5 1/4"	CENTER OF MAIN DRAIN
8	76'-4"	-89'-8 3/4"	CENTER OF MAIN DRAIN
9	12'-7"	-23'-0 3/4"	GUTTER DROPOUT BOX
10	76'-4"	-23'-0 3/4"	GUTTER DROPOUT BOX
11	140'-1"	-23'-0 3/4"	GUTTER DROPOUT BOX
12	165'-2 3/4"	-62'-3 1/4"	GUTTER DROPOUT BOX
13	140'-1"	-101'-6"	GUTTER DROPOUT BOX
14	76'-4"	-101'-6"	GUTTER DROPOUT BOX
15	12'-7"	-101'-6"	GUTTER DROPOUT BOX
16	-12'-6 3/4"	-62'-3 1/4"	GUTTER DROPOUT BOX
17	-5'-3 1/2"	-30'-3"	FLOOR INLET
18	19'-2 3/4"	-30'-3"	FLOOR INLET
19	41'-0"	-30'-3"	FLOOR INLET
20	62'-9 1/4"	-30'-3"	FLOOR INLET
21	84'-6 1/2"	-30'-3"	FLOOR INLET
22	106'-3 3/4"	-30'-3"	FLOOR INLET
23	128'-1"	-30'-3"	FLOOR INLET
24	149'-10 1/4"	-30'-3"	FLOOR INLET
25	157'-11 3/4"	-39'-4 3/4"	FLOOR INLET
26	137'-5 1/4"	-39'-4 3/4"	FLOOR INLET
27	115'-8 1/4"	-39'-4 3/4"	FLOOR INLET
28	93'-11"	-39'-4 3/4"	FLOOR INLET
29	72'-1 3/4"	-39'-4 3/4"	FLOOR INLET
30	50'-4 1/2"	-39'-4 3/4"	FLOOR INLET
31	28'-7 1/4"	-39'-4 3/4"	FLOOR INLET
32	6'-10"	-39'-4 3/4"	FLOOR INLET
33	-5'-3 1/2"	-48'-6 1/2"	FLOOR INLET
34	19'-2 3/4"	-48'-6 1/2"	FLOOR INLET
35	41'-0"	-48'-6 1/2"	FLOOR INLET
36	62'-9 1/4"	-48'-6 1/2"	FLOOR INLET
37	84'-6 1/2"	-48'-6 1/2"	FLOOR INLET
38	106'-3 3/4"	-48'-6 1/2"	FLOOR INLET
39	128'-1"	-48'-6 1/2"	FLOOR INLET
40	149'-10 1/4"	-48'-6 1/2"	FLOOR INLET
41	157'-11 3/4"	-57'-8 1/2"	FLOOR INLET
42	137'-5 1/4"	-57'-8 1/2"	FLOOR INLET
43	115'-8 1/4"	-57'-8 1/2"	FLOOR INLET
44	93'-11"	-57'-8 1/2"	FLOOR INLET
45	72'-1 3/4"	-57'-8 1/2"	FLOOR INLET
46	50'-4 1/2"	-57'-8 1/2"	FLOOR INLET
47	28'-7 1/4"	-57'-8 1/2"	FLOOR INLET
48	6'-10"	-57'-8 1/2"	FLOOR INLET
49	-5'-3 1/2"	-66'-10 1/4"	FLOOR INLET
50	19'-2 3/4"	-66'-10 1/4"	FLOOR INLET
51	41'-0"	-66'-10 1/4"	FLOOR INLET
52	62'-9 1/4"	-66'-10 1/4"	FLOOR INLET
53	84'-6 1/2"	-66'-10 1/4"	FLOOR INLET
54	106'-3 3/4"	-66'-10 1/4"	FLOOR INLET
55	128'-1"	-66'-10 1/4"	FLOOR INLET
56	149'-10 1/4"	-66'-10 1/4"	FLOOR INLET
57	157'-11 3/4"	-76'-0"	FLOOR INLET
58	137'-5 1/4"	-76'-0"	FLOOR INLET
59	115'-8 1/4"	-76'-0"	FLOOR INLET
60	93'-11"	-76'-0"	FLOOR INLET
61	72'-1 3/4"	-76'-0"	FLOOR INLET
62	50'-4 1/2"	-76'-0"	FLOOR INLET
63	28'-7 1/4"	-76'-0"	FLOOR INLET
64	6'-10"	-76'-0"	FLOOR INLET
65	-5'-3 1/2"	-85'-1 3/4"	FLOOR INLET
66	19'-2 3/4"	-85'-1 3/4"	FLOOR INLET
67	41'-0"	-85'-1 3/4"	FLOOR INLET
68	62'-9 1/4"	-85'-1 3/4"	FLOOR INLET
69	84'-6 1/2"	-85'-1 3/4"	FLOOR INLET
70	106'-3 3/4"	-85'-1 3/4"	FLOOR INLET
71	128'-1"	-85'-1 3/4"	FLOOR INLET
72	149'-10 1/4"	-85'-1 3/4"	FLOOR INLET
73	157'-11 3/4"	-94'-3 3/4"	FLOOR INLET
74	137'-5 1/4"	-94'-3 3/4"	FLOOR INLET
75	115'-8 1/4"	-94'-3 3/4"	FLOOR INLET
76	93'-11"	-94'-3 3/4"	FLOOR INLET
77	72'-1 3/4"	-94'-3 3/4"	FLOOR INLET
78	50'-4 1/2"	-94'-3 3/4"	FLOOR INLET
79	28'-7 1/4"	-94'-3 3/4"	FLOOR INLET
80	6'-10"	-94'-3 3/4"	FLOOR INLET
81	81'-11"	-13'-0 3/4"	SIGHT SUMP
82	-6'-2"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
83	1'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
84	8'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
85	16'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
86	23'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
87	31'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
88	34'-10 3/4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
89	38'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
90	46'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
91	53'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
92	61'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
93	68'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
94	76'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
95	83'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
96	91'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
97	98'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
98	106'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
99	113'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
100	118'-11"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
101	121'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
102	122'-5 3/4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
103	128'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
104	135'-3 3/4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
105	136'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
106	138'-10 1/2"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
107	143'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
108	151'-4"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
109	158'-10"	-23'-0 3/4"	LANE ROPE CUP ANCHOR
110	165'-2 3/4"	-25'-8"	LANE ROPE CUP ANCHOR
111	165'-2 3/4"	-34'-10"	LANE ROPE CUP ANCHOR
112	165'-2 3/4"	-43'-11 3/4"	LANE ROPE CUP ANCHOR
113	165'-2 3/4"	-53'-1 1/2"	LANE ROPE CUP ANCHOR
114	165'-2 3/4"	-62'-3 1/4"	LANE ROPE CUP ANCHOR
115	165'-2 3/4"	-71'-5 1/4"	LANE ROPE CUP ANCHOR
116	165'-2 3/4"	-80'-7"	LANE ROPE CUP ANCHOR
117	165'-2 3/4"	-89'-8 3/4"	LANE ROPE CUP ANCHOR
118	165'-2 3/4"	-98'-10 1/2"	LANE ROPE CUP ANCHOR
119	158'-10"	-101'-6"	LANE ROPE CUP ANCHOR
120	151'-4"	-101'-6"	LANE ROPE CUP ANCHOR
121	143'-10"	-101'-6"	LANE ROPE CUP ANCHOR
122	138'-10 1/2"	-101'-6"	LANE ROPE CUP ANCHOR
123	136'-4"	-101'-6"	LANE ROPE CUP ANCHOR
124	135'-3 3/4"	-101'-6"	LANE ROPE CUP ANCHOR
125	128'-10"	-101'-6"	LANE ROPE CUP ANCHOR
126	122'-5 3/4"	-101'-6"	LANE ROPE CUP ANCHOR
127	121'-4"	-101'-6"	LANE ROPE CUP ANCHOR
128	118'-11"	-101'-6"	LANE ROPE CUP ANCHOR
129	113'-10"	-101'-6"	LANE ROPE CUP ANCHOR
130	106'-4"	-101'-6"	LANE ROPE CUP ANCHOR
131	98'-10"	-101'-6"	LANE ROPE CUP ANCHOR
132	91'-4"	-101'-6"	LANE ROPE CUP ANCHOR
133	83'-10"	-101'-6"	LANE ROPE CUP ANCHOR
134	76'-4"	-101'-6"	LANE ROPE CUP ANCHOR
135	68'-10"	-101'-6"	LANE ROPE CUP ANCHOR
136	61'-4"	-101'-6"	LANE ROPE CUP ANCHOR
137	53'-10"	-101'-6"	LANE ROPE CUP ANCHOR
138	46'-4"	-101'-6"	LANE ROPE CUP ANCHOR
139	38'-10"	-101'-6"	LANE ROPE CUP ANCHOR
140	34'-10 3/4"	-101'-6"	LANE ROPE CUP ANCHOR
141	31'-4"	-101'-6"	LANE ROPE CUP ANCHOR
142	23'-10"	-101'-6"	LANE ROPE CUP ANCHOR
143	16'-4"	-101'-6"	LANE ROPE CUP ANCHOR
144	8'-10"	-101'-6"	LANE ROPE CUP ANCHOR
145	1'-4"	-101'-6"	LANE ROPE CUP ANCHOR
146	-6'-2"	-101'-6"	LANE ROPE CUP ANCHOR
147	-12'-6 3/4"	-98'-10 1/2"	LANE ROPE CUP ANCHOR
148	-12'-6 3/4"	-89'-8 3/4"	LANE ROPE CUP ANCHOR
149	-12'-6 3/4"	-80'-7"	LANE ROPE CUP ANCHOR
150	-12'-6 3/4"	-71'-5 1/4"	LANE ROPE CUP ANCHOR
151	-12'-6 3/4"	-62'-3 1/4"	LANE ROPE CUP ANCHOR
152	-12'-6 3/4"	-43'-11 3/4"	LANE ROPE CUP ANCHOR
153	-12'-6 3/4"	-34'-10"	LANE ROPE CUP ANCHOR
154	-12'-6 3/4"	-25'-8"	LANE ROPE CUP ANCHOR
155	4'-2 1/4"	-22'-0 3/4"	STANCHION POST ANCHOR
156	5'-7 1/4"	-22'-0 3/4"	STANCHION POST ANCHOR
157	11'-8 1/4"	-22'-0 3/4"	STANCHION POST ANCHOR
158	49'-3"	-22'-0 3/4"	STANCHION POST ANCHOR
159	53'-9 1/2"	-22'-0 3/4"	STANCHION POST ANCHOR
160	54'-10 1/2"	-22'-0 3/4"	STANCHION POST ANCHOR
161	60'-10 3/4"	-22'-0 3/4"	STANCHION POST ANCHOR
162	93'-9 1/4"	-22'-0 3/4"	STANCHION POST ANCHOR
163	97'-9 1/2"	-22'-0 3/4"	STANCHION POST ANCHOR
164	98'-10 1/4"	-22'-0 3/4"	STANCHION POST ANCHOR
165	103'-5"	-22'-0 3/4"	STANCHION POST ANCHOR
166	142'-11 3/4"	-22'-0 3/4"	STANCHION POST ANCHOR
167	147'-0 3/4"	-22'-0 3/4"	STANCHION POST ANCHOR
168	148'-5 3/4"	-22'-0 3/4"	STANCHION POST ANCHOR
169	164'-5 3/4"	-39'-9"	STANCHION POST ANCHOR
170	164'-5 3/4"	-84'-9 3/4"	STANCHION POST ANCHOR
171	148'-5 3/4"	-102'-3 3/4"	STANCHION POST ANCHOR
172	147'-0 3/4"	-102'-3 3/4"	STANCHION POST ANCHOR
173	142'-11 3/4"	-102'-3 3/4"	STANCHION POST ANCHOR
174	103'-5"	-102'-3 3/4"	STANCHION POST ANCHOR
175	98'-10 1/4"	-102'-3 3/4"	STANCHION POST ANCHOR
176	97'-9 1/2"	-102'-3 3/4"	STANCHION POST ANCHOR
177	93'-9 1/4"	-102'-3 3/4"	STANCHION POST ANCHOR
178	60'-10 3/4"	-102'-3 3/4"	STANCHION POST ANCHOR
179	54'-10 1/2"	-102'-3 3/4"	STANCHION POST ANCHOR
180	53'-9 1/2"	-102'-3 3/4"	STANCHION POST ANCHOR
181	49'-3"	-102'-3 3/4"	STANCHION POST ANCHOR
182	11'-8 1/4"	-102'-3 3/4"	STANCHION POST ANCHOR
183	5'-7 1/4"	-102'-3 3/4"	STANCHION POST ANCHOR
184	4'-2 1/4"	-102'-3 3/4"	STANCHION POST ANCHOR
185	-16'-2 1/4"	-39'-9"	TAGLINE STANCHION POST ANCHOR
186	-16'-2 1/4"	-84'-9 3/4"	TAGLINE STANCHION POST ANCHOR
187	168'-10 1/4"	-39'-9"	TAGLINE STANCHION POST ANCHOR
188	168'-10 1/4"	-84'-9 3/4"	TAGLINE STANCHION POST ANCHOR
189	-12'-11 3/4"	-94'-3 3/4"	STARTING BLOCK ANCHOR
190	-12'-11 3/4"	-85'-1 3/4"	STARTING BLOCK ANCHOR
191	-12'-11 3/4"	-76'-0"	STARTING BLOCK ANCHOR
192	-12'-11 3/4"	-66'-10 1/4"	STARTING BLOCK ANCHOR
193	-12'-11 3/4"	-57'-8 1/2"	STARTING BLOCK ANCHOR
194	-12'-11 3/4"	-48'-6 1/2"	STARTING BLOCK ANCHOR
195	-12'-11 3/4"	-39'-4 3/4"	STARTING BLOCK ANCHOR
196	-12'-11 3/4"	-30'-3"	STARTING BLOCK ANCHOR
197	-2'-5"	-22'-7"	STARTING BLOCK ANCHOR
198	5'-1"	-22'-7"	STARTING BLOCK ANCHOR
199	12'-7"	-22'-7"	STARTING BLOCK ANCHOR
200	20'-1"	-22'-7"	STARTING BLOCK ANCHOR
201	27'-7"	-22'-7"	STARTING BLOCK ANCHOR
202	35'-1"	-22'-7"	STARTING BLOCK ANCHOR
203	42'-7"	-22'-7"	STARTING BLOCK ANCHOR
204	50'-1"	-22'-7"	STARTING BLOCK ANCHOR
205	57'-7"	-22'-7"	STARTING BLOCK ANCHOR
206	65'-1"	-22'-7"	STARTING BLOCK ANCHOR
207	72'-7"	-22'-7"	STARTING BLOCK ANCHOR
208	80'-1"	-22'-7"	STARTING BLOCK ANCHOR
209	87'-7"	-22'-7"	STARTING BLOCK ANCHOR
210	95'-1"	-22'-7"	STARTING BLOCK ANCHOR
211	102'-7"	-22'-7"	STARTING BLOCK ANCHOR
212	110'-1"	-22'-7"	STARTING BLOCK ANCHOR
213	117'-7"	-22'-7"	STARTING BLOCK ANCHOR
214	125'-1"	-22'-7"	STARTING BLOCK ANCHOR
215	132'-7"	-22'-7"	STARTING BLOCK ANCHOR
216	140'-1"	-22'-7"	STARTING BLOCK ANCHOR
217	147'-7"	-22'-7"	STARTING BLOCK ANCHOR
218	155'-1"	-22'-7"	STARTING BLOCK ANCHOR
219	165'-7 3/4"	-30'-3"	STARTING BLOCK ANCHOR
220	165'-7 3/4"	-39'-4 3/4"	STARTING BLOCK ANCHOR
221	165'-7 3/4"	-48'-6 1/2"	STARTING BLOCK ANCHOR
222	165'-7 3/4"	-57'-8 1/2"	STARTING BLOCK ANCHOR
223	165'-7 3/4"	-66'-10 1/4"	STARTING BLOCK ANCHOR
224	165'-7 3/4"	-76'-0"	STARTING BLOCK ANCHOR
225	165'-7 3/4"	-85'-1 3/4"	STARTING BLOCK ANCHOR
226	165'-7 3/4"	-94'-3 3/4"	STARTING BLOCK ANCHOR
227	-6'-2"	-24'-9"	UNDERWATER LIGHT
228	8'-10"	-24'-9"	UNDERWATER LIGHT
229	23'-10"	-24'-9"	UNDERWATER LIGHT
230	38'-10"	-24'-9"	UNDERWATER LIGHT
231	53'-10"	-24'-9"	UNDERWATER LIGHT
232	68'-10"	-24'-9"	UNDERWATER LIGHT
233	76'-4"	-24'-9"	UNDERWATER LIGHT
234	83'-10"	-24'-9"	UNDERWATER LIGHT
235	98'-10"	-24'-9"	UNDERWATER LIGHT
236	113'-10"	-24'-9"	UNDERWATER LIGHT
237	128'-10"	-24'-9"	UNDERWATER LIGHT
238	143'-10"	-24'-9"	UNDERWATER LIGHT
239	158'-10"	-24'-9"	UNDERWATER LIGHT
240	163'-5 3/4"	-34'-10"	UNDERWATER LIGHT
241	163'-5 3/4"	-53'-1 1/2"	UNDERWATER LIGHT
242	163'-5 3/4"	-71'-5 1/4"	UNDERWATER LIGHT
243	163'-5 3/4"	-89'-8 3/4"	UNDERWATER LIGHT
244	158'-10"	-99'-9 3/4"	UNDERWATER LIGHT
245	143'-10"	-99'-9 3/4"	UNDERWATER LIGHT
246	128'-10"	-99'-9 3/4"	UNDERWATER LIGHT
247	113'-10"	-99'-9 3/4"	UNDERWATER LIGHT
248	98'-10"	-99'-9 3/4"	UNDERWATER LIGHT
249	83'-10"	-99'-9 3/4"	UNDERWATER LIGHT
250	76'-4"	-99'-9 3/4"	UNDERWATER LIGHT
251	68'-10"	-99'-9 3/4"	UNDERWATER LIGHT
252	53'-10"	-99'-9 3/4"	UNDERWATER LIGHT
253	38'-10"	-99'-9 3/4"	UNDERWATER LIGHT
254	23'-10"	-99'-9 3/4"	UNDERWATER LIGHT
255	8'-10"	-99'-9 3/4"	UNDERWATER LIGHT
256	-6'-2"	-99'-9 3/4"	UNDERWATER LIGHT
257	-10'-9 3/4"	-89'-8 3/4"	UNDERWATER LIGHT
258	-10'-9 3/4"	-71'-5 1/4"	UNDERWATER LIGHT
259	-10'-9 3/4"	-53'-1 1/2"	UNDERWATER LIGHT
260	-10'-9 3/4"	-34'-10"	UNDERWATER LIGHT
261	1'-4"	-24'-9"	GRAB RAILS & RECESSED STEPS
262	46'-4"	-24'-9"	GRAB RAILS & RECESSED STEPS
263	106'-4"	-24'-9"	GRAB RAILS & RECESSED STEPS
264	151'-4"	-24'-9"	GRAB RAILS & RECESSED STEPS
265	151'-4"	-99'-9 3/4"	GRAB RAILS & RECESSED STEPS
266	106'-4"	-99'-9 3/4"	GRAB RAILS & RECESSED STEPS
267	46'-4"	-99'-9 3/4"	GRAB RAILS & RECESSED STEPS
268	1'-4"	-99'-9 3/4"	GRAB RAILS & RECESSED STEPS
269	11'-2 1/4"	-101'-11 3/4"	POOL LIFT ANCHOR
270	141'-5 3/4"	-101'-11 3/4"	POOL LIFT ANCHOR

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION DOCUMENTS

PROPOSED

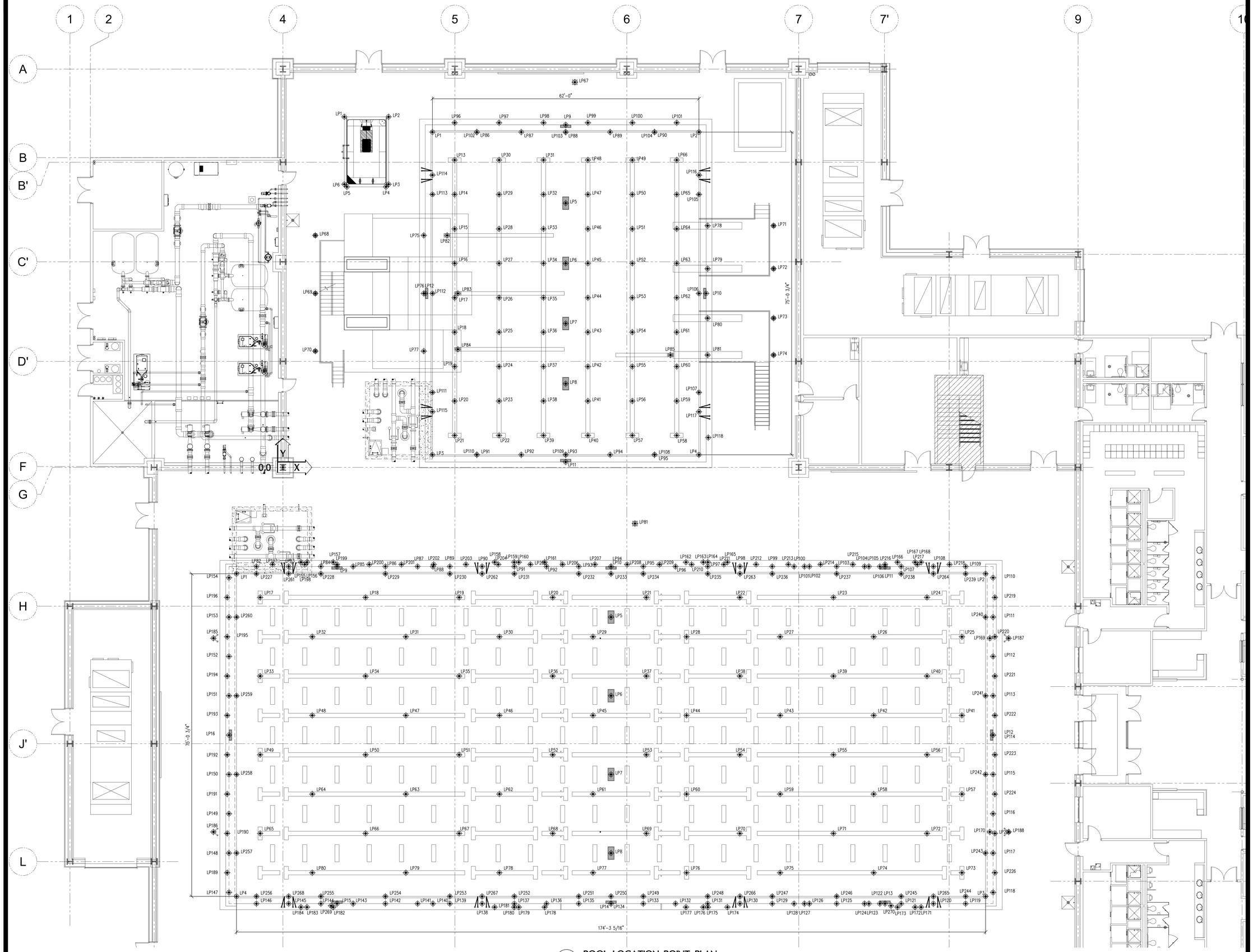
CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

SP4.00

POOL LOCATION POINT SCHEDULES



1 SP4.01 **POOL LOCATION POINT PLAN**

1/8" = 1'-0"

TWG
THE WARREN GROUP ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

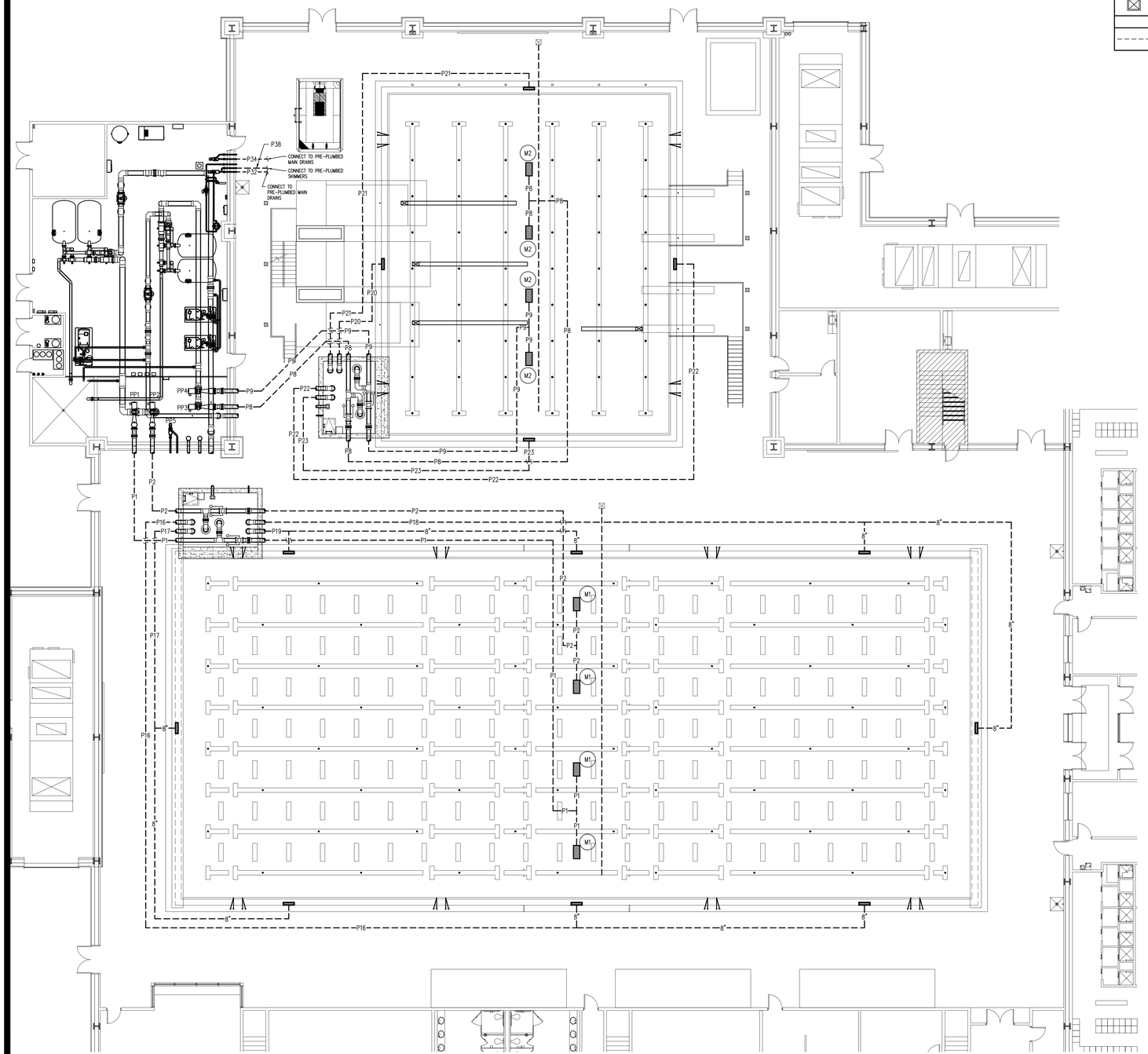
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 071805
DATE 06/07/2019
REVISED

SP4.01
POOL LOCATION POINT PLAN



1 SP5.00 **POOL SUCTION PIPING PLAN**

3/32" = 1'-0"

PIPING LEGEND

LEGEND	QTY.	ITEM
COMPETITION POOL		
◉	64	FLOOR INLET REFER: 4/SP6.04
⊠	1	SIGHT SUMP REFER: 10/SP6.04
▭	8	GUTTER DROPOUT BOX REFER: 5/SP6.04
▭	4	MAIN DRAIN REFER: 7/SP6.04
DIVE POOL		
◉	54	FLOOR INLET REFER: 4/SP6.04
⊠	1	SIGHT SUMP REFER: 10/SP6.04
▭	4	GUTTER DROPOUT BOX REFER: 5/SP6.04
▭	4	MAIN DRAIN REFER: 7/SP6.04
⊠	7	AGITATOR BOX REFER: 11/SP2.01
COMBINED		
- - - - -	N/A	BELOW GRADE PIPING

GENERAL PIPING NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERATIONAL PIPING SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. PIPE SIZES INDICATED ARE NOMINAL, I.P.S.
3. UNLESS OTHERWISE NOTED, ALL OVERHEAD PIPING SHALL BE TIGHT TO UNDERSIDE OF STRUCTURE OR SLAB.
4. ALL BALANCING VALVES AND BUTTERFLY VALVES SHALL BE PROVIDED WITH POSITION INDICATORS AND MAXIMUM ADJUSTABLE STOPS (MEMORY STOPS).
5. ALL VALVES SHALL BE INSTALLED SO THAT THE VALVE REMAINS IN SERVICE WHEN THE EQUIPMENT OR PIPING ON THE EQUIPMENT SIDE OF THE VALVE IS REMOVED.
6. PROVIDE CHAIN WHEEL OPERATORS FOR ALL VALVES IN EQUIPMENT ROOMS MOUNTED GREATER THAN 7'-0" ABOVE FINISHED FLOOR; CHAIN SHALL EXTEND TO 7'-0" ABOVE FINISHED FLOOR LEVEL.
7. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
8. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES AND SITE CONDITIONS. OFFSETS, EXPANSION LOOPS, OR TRANSITIONS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
9. ALL PIPING INDICATED SHALL BE CONSIDERED DIAGRAMMATIC.
10. ALL SWIMMING POOL PIPING ROUTED BELOW THE POOL SHELL SHALL BE CONCRETE ENCASED SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED. REFER: 8/SP6.04.
11. ALL UNDERGROUND OR EXPOSED SWIMMING POOL PIPING SHALL BE SCHEDULE 80 PVC, UNLESS OTHERWISE NOTED. CONTRACTOR SHALL REFER TO PLANS AND SPECIFICATIONS FOR ANY SPECIFIC REQUIREMENTS REGARDING PLACEMENT AND BACKFILLING OF BELOW GRADE POOL PIPE.
12. ALL DIMENSIONS INDICATED FROM THE FINISH WALL SURFACE AND DO NOT ACCOUNT FOR ANY VARIATIONS IN EITHER GRADE OR SLOPE DISTANCES.
13. THE CHEMICAL SENSOR LINE SHALL BE A 3/4" TO 1" DIAMETER, SCHEDULE 80 PVC PIPE EXTENDED FROM THE WET CELL SENSOR TO ITS RESPECTIVE FILL FUNNEL AND THE BACKWASH CATCH BASIN OR PUMP SUCTION.
14. ALL FLOOR INLETS SHALL BE ADJUSTED TO ACHIEVE AN EVEN FLOW DISTRIBUTION THROUGHOUT SYSTEMS.
15. ALL PIPE TEES SHALL BE SIZED FOR LARGEST PIPE CONNECTION.
16. SURGE TANK VENT PIPING TO ATMOSPHERE–REFER TO PLUMBING.
17. ALL GUTTER DROPOUT LINES SHALL SLOPE 1/8" PER FOOT MINIMUM

PUMP SCHEDULE

ID	DESCRIPTION	MANUFACTURER	MODEL	SIZE	GPM	TDH	HP	NPSHR	NOTES
PP1	COMPETITION POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,150	78	30	9.59	1,2,3,4
PP2	COMPETITION POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,150	78	30	9.59	1,2,3,4
PP3	DIVE POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,000	82	30	8.77	1,2,3,4
PP4	DIVE POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,000	82	30	8.77	1,2,3,4
PP5	ENDLESS POOL RECIRCULATION PUMP (ALTERNATE #2)	PENTAIR	INTELLIFLO I1	2.5X2.5	28	70	3	N/A	1,3,4,5
PP6	ENDLESS POOL HYDRO PUMP (ALTERNATE #2)	PENTAIR	WHISPERFLO	2X2	32	45	0.5	N/A	3,5
PP7	AGITATOR DRAIN DOWN PUMP REFER: 1/SP6.05	PENTAIR	INTELLIFLO I1	2.5X2.5	120	40	3	N/A	1,3,4,5

NOTE:
1. THE MANUFACTURER INDICATED IS BASIS OF DESIGN. PUMP MANUFACTURERS: ITT MARLOW, GRISWOLD, PACO OR AURORA SHALL BE CONSIDERED EQUAL PROVIDED THEY MEET SPECIFICATIONS AS INDICATED IN BID DOCUMENTS.
2. PROVIDE WITH 460 VOLT, 3 PHASE, 60HZ, 1750 RPM MOTOR.
3. PROVIDE WITH CHECK VALVE.
4. PROVIDE VARIABLE FREQUENCY DRIVE.
5. PROVIDE WITH 230 VOLT, 1 PHASE, 60HZ, 3450 RPM MOTOR.

MAIN DRAIN SCHEDULE

ID	DESCRIPTION	SIZE	QTY	DESIGN FLOW (GPM)	DESIGN VELOCITY (FPS)	MODEL	MANUFACTURER	NOTES
M1	COMPETITION POOL	18X36	4	2300	0.54	MLD-FG-1836	LAWSON	1,2,3,4,5,6
M2	DIVE POOL	18X36	4	2000	0.47	MLD-FG-1836	LAWSON	1,2,3,4,5,6

NOTE:
1. MAIN DRAIN GRATING SHALL BE MANUFACTURED BY NEPTUNE BENSON/LAWSON.
2. MAXIMUM FACE VELOCITY SHALL NOT EXCEED 1.5 FEET PER SECOND.
3. OPEN AREA IS BASED ON MANUFACTURER'S DATA.
4. THE INSTALLED LIFE OF THE MAIN DRAIN COVER SHALL BE 10 YEARS.
5. ALL MAIN DRAINS SHALL BE INSTALLED IN THE POOL FLOOR. WALL SUMPS WILL NOT BE PERMITTED.
6. FASTEN MAIN DRAIN COVER TO EMBEDDED PVC FRAME/POOL FLOOR WITH S/S TAMPER PROOF FASTENERS AT A SPACING NO GREATER THAN 24" O.C. REFER TO FRAME AND GRATE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

PIPE SCHEDULE

ID	DESCRIPTION
P1	10" FROM COMPETITION POOL MAIN DRAINS TO PP1
P2	10" FROM COMPETITION POOL MAIN DRAINS TO PP2
P3	3" FROM PP5 TO DIVE POOL AGITATORS
P4	6" FROM FILL FUNNEL TO COMPETITION POOL SURGE TANK
P5	6" FROM FILL FUNNEL TO DIVE POOL SURGE TANK
P6	12" FROM COMPETITION POOL FILTERS TO POOL INLETS
P7	10" FROM DIVE POOL FILTERS TO POOL INLETS
P8	10" FROM DIVE POOL MAIN DRAINS TO PP3
P9	10" FROM DIVE POOL MAIN DRAINS TO PP4
P10	12" FROM PP3 & PP4 TO DIVE POOL FILTERS
P11	14" FROM PP1 & PP2 TO COMPETITION POOL FILTERS
P12	3" FROM P10 TO BACKWASH CATCH BASIN
P13	3" FROM P11 TO BACKWASH CATCH BASIN
P14	6" FROM COMPETITION POOL FILTERS TO BACKWASH CATCH BASIN
P15	6" FROM DIVE POOL FILTERS TO BACKWASH CATCH BASIN
P16	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P17	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P18	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P19	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P20	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P21	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P22	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P23	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P24	3" FROM P6 TO COMPETITION POOL HEATER
P25	3" FROM COMPETITION POOL HEATER TO P6
P26	2" FROM P32 TO ENDLESS POOL HEATER
P27	2" FROM ENDLESS POOL HEATER TO P32
P28	3" FROM P7 TO DIVE POOL HEATER
P29	3" FROM DIVE POOL HEATER TO P7
P30	2" COMPETITION POOL SURGE TANK VENT (REFER TO MECHANICAL)
P31	2" DIVE POOL SURGE TANK VENT (REFER TO MECHANICAL)
P32	2" FROM ENDLESS POOL MAIN DRAINS TO PP5 (ALTERNATE #2)
P33	2" FROM ENDLESS POOL FILTER TO POOL INLETS (ALTERNATE #2)
P34	2" FROM ENDLESS POOL MAIN DRAINS TO PP6 (ALTERNATE #2)
P35	2" FROM PP6 TO ENDLESS POOL HYDRO JETS (ALTERNATE #2)
P36	2" FROM PP5 TO ENDLESS POOL FILTER (ALTERNATE #2)
P37	3" FROM PP7 TO DIVE POOL AGITATORS
P38	2" FROM ENDLESS POOL SKIMMERS TO P32 (ALTERNATE #2)

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			
4			

CONSTRUCTION DOCUMENTS

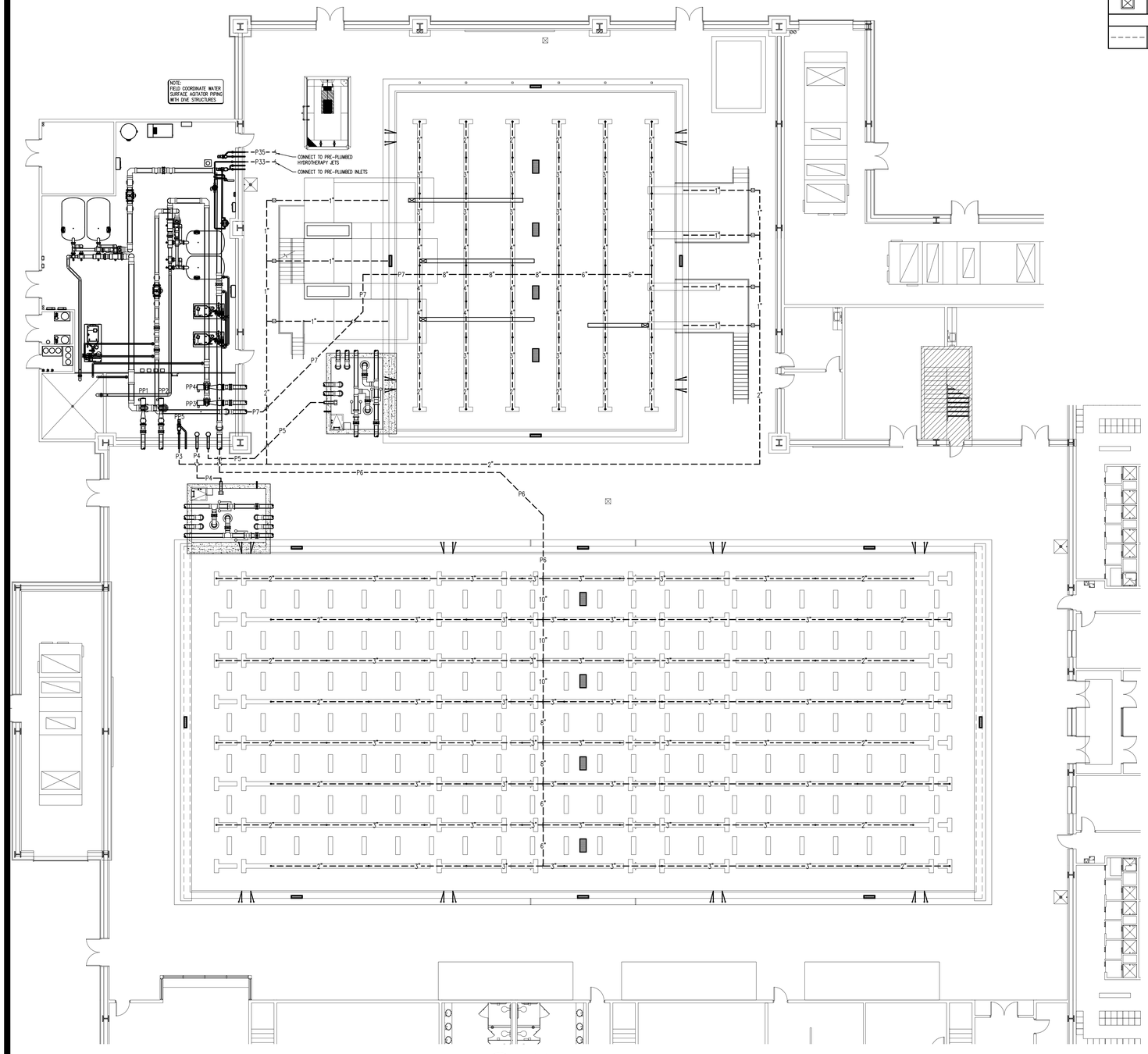
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

SP5.00
POOL SUCTION PIPING PLAN



1 SP5.01 **POOL RETURN PIPING PLAN**
3/32" = 1'-0"

PIPING LEGEND

LEGEND	QTY.	ITEM
COMPETITION POOL		
◉	64	FLOOR INLET REFER: 4/SP6.04
☒	1	SIGHT SUMP REFER: 10/SP6.04
▭	8	GUTTER DROPOUT BOX REFER: 5/SP6.04
▭	4	MAIN DRAIN REFER: 7/SP6.04
DIVE POOL		
◉	54	FLOOR INLET REFER: 4/SP6.04
☒	1	SIGHT SUMP REFER: 10/SP6.04
▭	4	GUTTER DROPOUT BOX REFER: 5/SP6.04
▭	4	MAIN DRAIN REFER: 7/SP6.04
☒	7	AGITATOR BOX REFER: 6/SP6.04
COMBINED		
- - - - -	N/A	BELOW GRADE PIPING

GENERAL PIPING NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERATIONAL PIPING SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. PIPE SIZES INDICATED ARE NOMINAL, I.P.S.
3. UNLESS OTHERWISE NOTED, ALL OVERHEAD PIPING SHALL BE TIGHT TO UNDERSIDE OF STRUCTURE OR SLAB.
4. ALL BALANCING VALVES AND BUTTERFLY VALVES SHALL BE PROVIDED WITH POSITION INDICATORS AND MAXIMUM ADJUSTABLE STOPS (MEMORY STOPS).
5. ALL VALVES SHALL BE INSTALLED SO THAT THE VALVE REMAINS IN SERVICE WHEN THE EQUIPMENT OR PIPING ON THE EQUIPMENT SIDE OF THE VALVE IS REMOVED.
6. PROVIDE CHAIN WHEEL OPERATORS FOR ALL VALVES IN EQUIPMENT ROOMS MOUNTED GREATER THAN 7'-0" ABOVE FINISHED FLOOR; CHAIN SHALL EXTEND TO 7'-0" ABOVE FINISHED FLOOR LEVEL.
7. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
8. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES AND SITE CONDITIONS. OFFSETS, EXPANSION LOOPS, OR TRANSITIONS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
9. ALL PIPING INDICATED SHALL BE CONSIDERED DIAGRAMMATIC.
10. ALL SWIMMING POOL PIPING ROUTED BELOW THE POOL SHELL SHALL BE CONCRETE ENCASED SCHEDULE 40 PVC, OR ALL SCHEDULE 80 PVC, UNLESS OTHERWISE NOTED. REFER: ---- & ----
11. ALL UNDERGROUND OR EXPOSED SWIMMING POOL PIPING SHALL BE SCHEDULE 80 PVC, UNLESS OTHERWISE NOTED. CONTRACTOR SHALL REFER TO PLANS AND SPECIFICATIONS FOR ANY SPECIFIC REQUIREMENTS REGARDING PLACEMENT AND BACKFILLING OF BELOW GRADE POOL PIPE.
12. ALL DIMENSIONS INDICATED FROM THE FINISH WALL SURFACE AND DO NOT ACCOUNT FOR ANY VARIATIONS IN EITHER GRADE OR SLOPE DISTANCES.
13. THE CHEMICAL SENSOR LINE SHALL BE A 3/4" TO 1" DIAMETER, SCHEDULE 80 PVC PIPE EXTENDED FROM THE WET CELL SENSOR TO ITS RESPECTIVE FILL FUNNEL AND THE BACKWASH CATCH BASIN OR PUMP SUCTION.
14. ALL FLOOR INLETS SHALL BE ADJUSTED TO ACHIEVE AN EVEN FLOW DISTRIBUTION THROUGHOUT SYSTEMS.
15. ALL PIPE TEES SHALL BE SIZED FOR LARGEST PIPE CONNECTION.
16. SURGE TANK VENT PIPING TO ATMOSPHERE
17. HYDROTHERAPY AIR VENT SHALL BE LOCATED A MINIMUM OF 4" ABOVE STATIC WATER LEVEL.
18. ALL GUTTER DROPOUT LINES SHALL SLOPE 1/8" PER FOOT MINIMUM
19. 55 PSI MINIMUM WATER PRESSURE FOR POOL LIFT. REFER TO PLUMBING.

POOL PIPING WINTERIZATION NOTES

1. ALL POOL PIPING SHALL HAVE THE CAPABILITY TO BE DRAINED FOR WINTERIZATION. (OUTDOOR POOLS ONLY)
2. ALL POOL SUCTION AND GRAVITY PIPING SHALL BE INSTALLED WITH A CONSTANT SLOPE TO THE MAIN DRAINS AND/OR SURGE TANK.
3. ALL POOL RETURN PIPING SHALL HAVE THE ABILITY TO COMPLETELY DRAIN TO THE 2" WINTERIZATION LINE AS SHOWN ON THE DRAWINGS.
4. ALL POOL SUCTION AND RETURN PIPING SHALL SLOPE BACK TO THE POOL MECHANICAL ROOM. A WINTERIZATION TAP AND VALVE SHALL BE PROVIDED ON PIPING ALLOWING THE ABILITY FOR ALL PIPING TO BE COMPLETELY DRAINED.
5. BLOW OUT ALL PIPES BY MEANS OF AN AIR BLOWER AND A WINTERIZATION TAP. CAP ALL PIPES. FOR ADDED PROTECTION AGAINST FREEZING PIPES, THE PIPES CAN BE FILLED WITH ANTI-FREEZE. REFER: -----

PUMP SCHEDULE

ID	DESCRIPTION	MANUFACTURER	MODEL	SIZE	GPM	TDH	HP	NPSHR	NOTES
PP1	COMPETITION POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,150	78	30	9.59	1,2,3,4
PP2	COMPETITION POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,150	78	30	9.59	1,2,3,4
PP3	DIVE POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,000	82	30	8.77	1,2,3,4
PP4	DIVE POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012.3LC	6X5	1,000	82	30	8.77	1,2,3,4
PP5	ENDLESS POOL RECIRCULATION PUMP (ALTERNATE #2)	PENTAIR	INTELLIFLO I1	2.5X2.5	28	70	3	N/A	1,3,4,5
PP6	ENDLESS POOL HYDRO PUMP (ALTERNATE #2)	PENTAIR	WHISPERFLO	2X2	32	45	0.5	N/A	3,5
PP7	AGITATOR DRAIN DOWN PUMP REFER: 1/SP6.05	PENTAIR	INTELLIFLO I1	2.5X2.5	120	40	3	N/A	1,3,4,5

NOTE:
1. THE MANUFACTURER INDICATED IS BASIS OF DESIGN. PUMP MANUFACTURERS: ITT MARLOW, GRISWOLD, PACO OR AURORA SHALL BE CONSIDERED EQUAL PROVIDED THEY MEET SPECIFICATIONS AS INDICATED IN BID DOCUMENTS.
2. PROVIDE WITH 460 VOLT, 3 PHASE, 60HZ, 1750 RPM MOTOR.
3. PROVIDE WITH CHECK VALVE.
4. PROVIDE VARIABLE FREQUENCY DRIVE.
5. PROVIDE WITH 230 VOLT, 1 PHASE, 60HZ, 3450 RPM MOTOR.

PIPE SCHEDULE

ID	DESCRIPTION
P1	10" FROM COMPETITION POOL MAIN DRAINS TO PP1
P2	10" FROM COMPETITION POOL MAIN DRAINS TO PP2
P3	3" FROM PP5 TO DIVE POOL AGITATORS
P4	6" FROM FILL FUNNEL TO COMPETITION POOL SURGE TANK
P5	6" FROM FILL FUNNEL TO DIVE POOL SURGE TANK
P6	12" FROM COMPETITION POOL FILTERS TO POOL INLETS
P7	10" FROM DIVE POOL FILTERS TO POOL INLETS
P8	10" FROM DIVE POOL MAIN DRAINS TO PP3
P9	10" FROM DIVE POOL MAIN DRAINS TO PP4
P10	12" FROM PP3 & PP4 TO DIVE POOL FILTERS
P11	14" FROM PP1 & PP2 TO COMPETITION POOL FILTERS
P12	3" FROM P10 TO BACKWASH CATCH BASIN
P13	3" FROM P11 TO BACKWASH CATCH BASIN
P14	6" FROM COMPETITION POOL FILTERS TO BACKWASH CATCH BASIN
P15	6" FROM DIVE POOL FILTERS TO BACKWASH CATCH BASIN
P16	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P17	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P18	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P19	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P20	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P21	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P22	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P23	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P24	3" FROM P6 TO COMPETITION POOL HEATER
P25	3" FROM COMPETITION POOL HEATER TO P6
P26	2" FROM P32 TO ENDLESS POOL HEATER
P27	2" FROM EMDLESS POOL HEATER TO P32
P28	3" FROM P7 TO DIVE POOL HEATER
P29	3" FROM DIVE POOL HEATER TO P7
P30	2" COMPETITION POOL SURGE TANK VENT (REFER TO MECHANICAL)
P31	2" DIVE POOL SURGE TANK VENT (REFER TO MECHANICAL)
P32	2" FROM ENDLESS POOL MAIN DRAINS TO PP5 (ALTERNATE #2)
P33	2" FROM ENDLESS POOL FILTER TO POOL INLETS (ALTERNATE #2)
P34	2" FROM ENDLESS POOL MAIN DRAINS TO PP6 (ALTERNATE #2)
P35	2" FROM PP6 TO ENDLESS POOL HYDRO JETS (ALTERNATE #2)
P36	2" FROM PP5 TO ENDLESS POOL FILTER (ALTERNATE #2)
P37	3" FROM PP7 TO DIVE POOL AGITATORS
P38	2" FROM ENDLESS POOL SKIMMERS TO P32 (ALTERNATE #2)

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

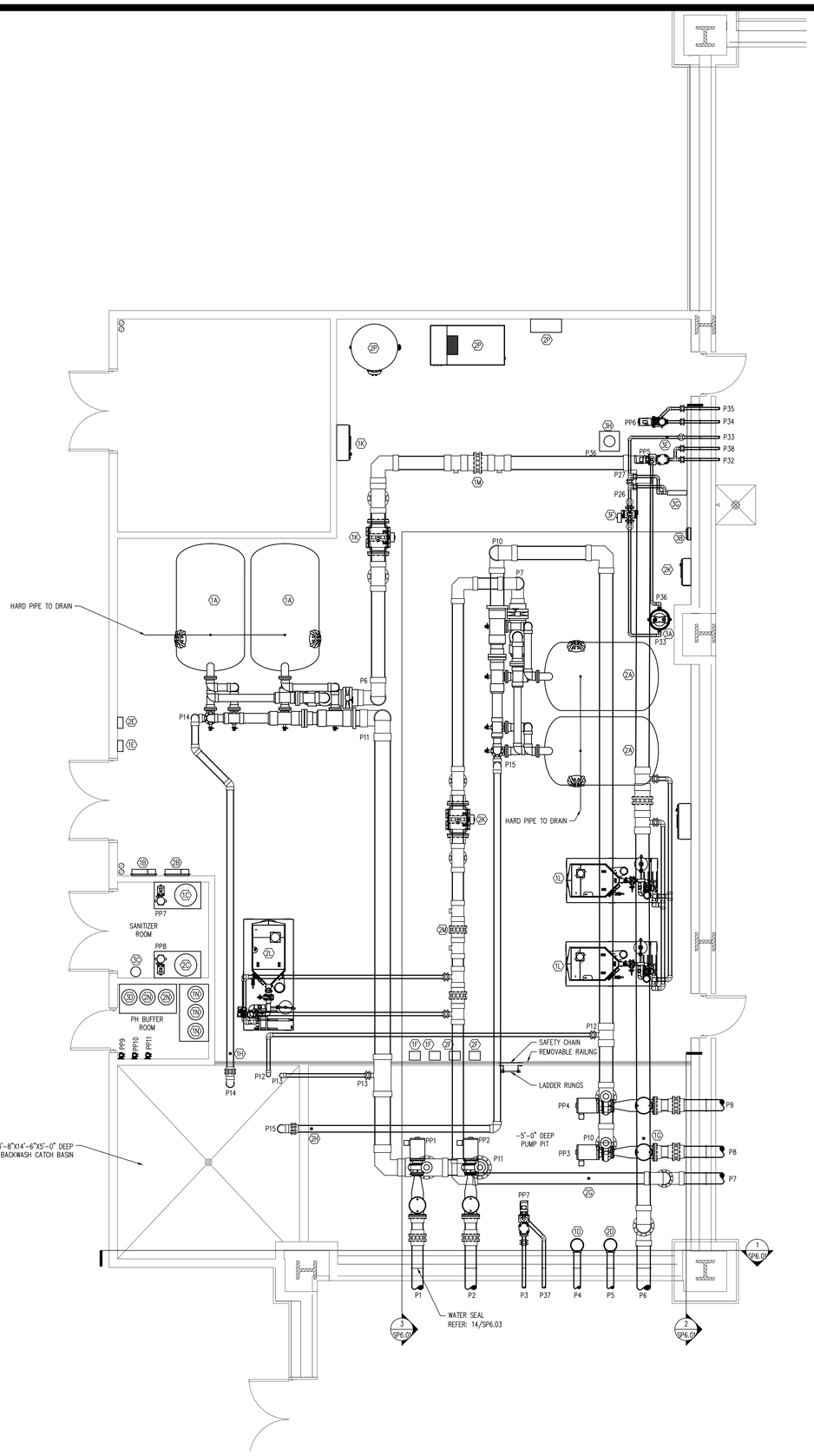
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

SP5.01
POOL RETURN PIPING PLAN



1 SP6.00 **POOL MECHANICAL ROOM PLAN**
1/4" = 1'-0"

EQUIPMENT SCHEDULE

ID	ITEM
	COMPETITION POOL
1A	FILTER SYSTEM
1B	CHEMICAL CONTROLLER REFER: 2/SP6.03
1C	CHLORINATION SYSTEM REFER: 6/SP6.03
1D	FILL FUNNEL REFER: 7/6.03
1E	WATER LEVEL CONTROLLER REFER: 13/sp6.04
1F	VARIABLE FREQUENCY DRIVE
1G	FLOW METER SENSOR REFER: 12/SP6.03
1H	IMPACT FLOW METER REFER: 13/SP6.03
1K	UV TREATMENT SYSTEM & CONTROLLER REFER: 9/SP6.03
1L	HEATER REFER: 6/SP6.05
1M	DEHUMIDIFICATION TEES
1N	ACID DRUM REFER: 3/SP6.03
	DIVE POOL
2A	FILTER SYSTEM
2B	CHEMICAL CONTROLLER REFER: 2/SP6.03
2C	CHLORINATION SYSTEM REFER: 6/SP6.03
2D	FILL FUNNEL REFER: 7/SP6.03
2E	WATER LEVEL CONTROLLER REFER: 13/SP6.04
2F	VARIABLE FREQUENCY DRIVE
2G	FLOW METER SENSOR REFER: 12/SP6.03
2H	IMPACT FLOW METER REFER: 13/SP6.03
2K	UV TREATMENT SYSTEM & CONTROLLER REFER: 9/SP6.03
2L	HEATER REFER: 5/SP6.05
2M	DEHUMIDIFICATION TEES
2N	ACID DRUM REFER: 3/SP6.03
2P	SPARGER EQUIPMENT
	ENDLESS POOL (ALTERNATE #2)
3A*	FILTER SYSTEM
3B	CHEMICAL CONTROLLER REFER: 2/SP6.03
3C	CHLORINATION SYSTEM REFER: 3/SP6.05
3D	ACID DRUM REFER: 3/SP6.03
3E*	FLOW METER SENSOR REFER: 12/SP6.03
3F	UV TREATMENT SYSTEM & CONTROLLER REFER: 9/SP6.03
3G*	HEATER REFER: 5/SP6.05
3H*	SWIM CURRENT – 7.5 HP POWER UNIT

* DENOTES ITEMS SUPPLIED BY MANUFACTURER AS PART OF THE PRE PACKAGED ENDLESS POOL SYSTEM

PIPE SCHEDULE

ID	DESCRIPTION
P1	10" FROM COMPETITION POOL MAIN DRAINS TO PP1
P2	10" FROM COMPETITION POOL MAIN DRAINS TO PP2
P3	3" FROM PP5 TO DIVE POOL AGITATORS
P4	6" FROM FILL FUNNEL TO COMPETITION POOL SURGE TANK
P5	6" FROM FILL FUNNEL TO DIVE POOL SURGE TANK
P6	12" FROM COMPETITION POOL FILTERS TO POOL INLETS
P7	10" FROM DIVE POOL FILTERS TO POOL INLETS
P8	10" FROM DIVE POOL MAIN DRAINS TO PP3
P9	10" FROM DIVE POOL MAIN DRAINS TO PP4
P10	12" FROM PP3 & PP4 TO DIVE POOL FILTERS
P11	14" FROM PP1 & PP2 TO COMPETITION POOL FILTERS
P12	3" FROM P10 TO BACKWASH CATCH BASIN
P13	3" FROM P11 TO BACKWASH CATCH BASIN
P14	6" FROM COMPETITION POOL FILTERS TO BACKWASH CATCH BASIN
P15	6" FROM DIVE POOL FILTERS TO BACKWASH CATCH BASIN
P16	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P17	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P18	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P19	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P20	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P21	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P22	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P23	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P24	3" FROM P6 TO COMPETITION POOL HEATER
P25	3" FROM COMPETITION POOL HEATER TO P6
P26	2" FROM P32 TO ENDLESS POOL HEATER
P27	2" FROM EMDLESS POOL HEATER TO P32
P28	3" FROM P7 TO DIVE POOL HEATER
P29	3" FROM DIVE POOL HEATER TO P7
P30	2" COMPETITION POOL SURGE TANK VENT (REFER TO MECHANICAL)
P31	2" DIVE POOL SURGE TANK VENT (REFER TO MECHANICAL)
P32	2" FROM ENDLESS POOL MAIN DRAINS TO PP5 (ALTERNATE #2)
P33	2" FROM ENDLESS POOL FILTER TO POOL INLETS (ALTERNATE #2)
P34	2" FROM ENDLESS POOL MAIN DRAINS TO PP6 (ALTERNATE #2)
P35	2" FROM PP6 TO ENDLESS POOL HYDRO JETS (ALTERNATE #2)
P36	2" FROM PP5 TO ENDLESS POOL FILTER (ALTERNATE #2)
P37	3" FROM PP7 TO DIVE POOL AGITATORS
P38	2" FROM ENDLESS POOL SKIMMERS TO P32 (ALTERNATE #2)

GENERAL POOL MECHANICAL ROOM NOTES

1. POOL PUMPS, STRAINERS, AND HEATERS SHALL BE INSTALLED ON HOUSEKEEPING PADS UNLESS NOTED OTHERWISE.
2. EQUIPMENT ROOM FLOOR AND PUMP PIT FLOOR SHALL SLOPE 1/4" TO 1/2" PER FOOT TO FLOOR DRAINS OR SUMP PIT. REFER TO PLUMBING.
3. PROVIDE HOSE BIBBS FOR HOUSE CLEANING PURPOSES. REFER BUILDING MECHANICAL DRAWINGS.
4. THE INSIDE SURFACES OF THE BACKWASH CATCH BASIN SHALL BE WATERPROOFED. REFER TO SPECIFICATION.
5. VENTILATION OF POOL MECHANICAL ROOM AND CHEMICAL STORAGE AREAS PER LOCAL, STATE AND INTERNATIONAL MECHANICAL CODE MINIMUM. REFER TO MECHANICAL.
6. THE FOLLOWING INFORMATION SHALL BE LAMINATED AND POSTED IN THE POOL MECHANICAL ROOM: BACKWASH PROCEDURE, POOL FILLING & DRAINING, VALVE REFERENCE CHART, POOL MECHANICAL ROOM PLAN, POOL PIPING SCHEMATICS & POOL SYSTEMS SCHEMATICS.
7. REFER TO MECHANICAL FOR HVAC SYSTEMS DESIGN.
8. REFER TO ARCHITECTURAL DRAWINGS FOR LADDER RUNGS, SAFETY CHAIN, & REMOVABLE RAILING AT PUMP PIT.

PIPING

1. MINIMUM 7'-0" CLEARANCE BENEATH ALL OVERHEAD PIPING.
2. PROVIDE AND SUPPORT OVERHEAD AND VERTICAL PIPING PER SPECIFICATION REQUIREMENTS.
3. LABEL AND IDENTIFY ALL PIPING IN COMPLIANCE WITH THE SPECIFICATIONS.
4. ALL FLOW METERS SHALL BE SIZED TO MATCH THE PIPE ON WHICH IT IS INSTALLED. PROVIDE PRESSURE GAUGES ON INFLUENT AND EFFLUENT SIDE OF EACH FILTRATION SYSTEM AND A FULL LINE SIZE FLOW METER ON FILTER RETURN.
5. THE BACKWASH PIPING SHALL TERMINATE NO CLOSER THAN 6" ABOVE THE FLOOD RIM OF THE BACKWASH CATCH BASIN OR TWICE THE PIPE DIAMETER, WHICHEVER IS GREATER.
6. HYDROSTATICALLY TEST ALL PIPING AT 50 PSI FOR TWO HOURS AND MAINTAIN A PRESSURE OF 20 PSI IN ALL PIPING THROUGHOUT CONSTRUCTION. SECURE ALL FIXTURES PER SPECIFICATION REQUIREMENTS BEFORE HYDROSTATIC TEST.
7. REFER TO DETAILS 8-15/6.03 & 1-3/6.04 FOR INSTALLATION OF PIPE SUPPORTS.

FILTERS

1. ALL FILTER SUPPORTS SHALL BE SEISMICALLY RATED FOR THE SEISMIC ZONE IN WHICH IT IS INSTALLED IN ACCORDANCE WITH LOCAL AND/ OR STATE REQUIREMENTS.
2. FILTER MANUFACTURER SHALL CERTIFY FILTER MEDIA.
3. VALVES SHALL BE PROVIDED TO BACKWASH EACH FILTER VESSEL INDEPENDENTLY.
4. FILTER TANK ASSEMBLIES SHALL BEAR THE NATIONAL SANITATION FOUNDATION SEAL OF APPROVAL FOR A MAXIMUM FLOW RATE OF 20 GPM PER SQUARE FOOT OF FILTER MEDIA.
5. THE BACKWASH THROTTLING VALVE(S) HANDLE SHALL BE REMOVED AND TURNED OVER TO THE OWNER ONCE THE BACKWASH FLOW RATE(S) HAVE BEEN TESTED, ADJUSTED AND BALANCED.
6. PROVIDE 1" DIAMETER, SCHEDULE 80 PIPE FROM THE AUTOMATIC AIR VENT ON EACH FILTER VESSEL TO THE NEAREST FLOOR DRAIN OR BACKWASH CATCH BASIN. THE VENT PIPE SHALL BE SLOPED TO THE DRAIN.
7. VESSEL SHALL BE BACKWASHED AT NO LESS THAN 15.0 GPM/SF.

CHEMICAL TREATMENT

1. CHEMICAL FEED REQUIREMENTS – REFER TO THE POOL SYSTEMS SCHEMATIC(S) ON SP7.00.
2. INTERLOCK POOL CIRCULATION PUMP(S) WITH ITS CORRESPONDING WATER CHEMISTRY CONTROLLER, CHEMICAL FEED PUMP(S), AND HEATER(S).
3. PROVIDE SIGNAGE ON CHEMICAL ROOM DOORS IN COMPLIANCE WITH THE STATE FIRE CODE. REFER 11/SP6.03.
4. SECURE CHEMICAL METERING PUMP FEED LINES TO WALL AND/OR OVERHEAD WITH CLIPS OR DEVICES THAT DO NOT CRIMP, DISTORT OR ALLOW HIGH AND LOW AREAS IN TUBING RUNS. PROVIDE CHECK VALVE AND SHUT-OFF VALVE BEFORE LINES ENTER POOL RETURN PIPING.
5. WATER CHEMISTRY CONTROLLERS SHALL CONTROL THE SANITIZING SYSTEM AND PH CONTROL SYSTEM AND SHUT THEM DOWN UPON LOSS OF SAMPLE STREAM FLOW.
6. THE CHEMICAL CONTROL SYSTEM BYPASS LINE SHALL SAMPLE WATER AFTER THE FILTERS AND BEFORE THE HEATER BYPASS LINE.
7. VERIFY REMOTE ACCESS CAPABILITY TO ALL CHEMICAL CONTROLLERS. REFER TO ELECTRICAL.
8. LOCATE CHEMICAL INJECTION POINT AFTER THE FLOW METER SENSOR AND AT MAXIMUM HEIGHT OF 7'-0" ABOVE FINISHED FLOOR. REFER: 10/SP6.03

PUMPS

1. PROVIDE INFLUENT AND EFFLUENT GAUGES FOR EACH PUMP. PRESSURE GAUGES HAVE A RANGE OF 0-60 PSI. COMPOUND GAUGES HAVE A RANGE OF 0-30 HG / 0-60 PSI.

ELECTRICAL

1. GFCI'S PROVIDED AT OUTLETS. REFER TO ELECTRICAL.
2. POOL EQUIPMENT ROOM AND CHEMICAL STORAGE AREAS SHALL BE PROVIDED WITH ARTIFICIAL LIGHTING SUFFICIENT TO ILLUMINATE ALL EQUIPMENT AND SUPPLIES. REFER TO ELECTRICAL.
3. CONDUIT SHALL BE ROUTED OVERHEAD OR BELOW GRADE.
4. PROVIDE ELECTRICAL CONNECTION TO POOL HEATERS. REFER TO ELECTRICAL.

PUMP SCHEDULE

ID	DESCRIPTION	MANUFACTURER	MODEL	SIZE	GPM	TDH	HP	NPSHR	NOTES
PP1	COMPETITION POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012JLC	6X5	1,150	78	30	9.59	1,2,3,4
PP2	COMPETITION POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012JLC	6X5	1,150	78	30	9.59	1,2,3,4
PP3	DIVE POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	5012JLC	6X5	1,000	82	30	8.77	1,2,3,4
PP4	DIVE POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	5012JLC	6X5	1,000	82	30	8.77	1,2,3,4
PP5	ENDLESS POOL RECIRCULATION PUMP (ALTERNATE #2)	PENTAIR	INTELLIFLO I1	2.5X2.5	28	70	3	N/A	1,3,4,5
PP6	ENDLESS POOL HYDRO PUMP (ALTERNATE #2)	PENTAIR	WHISPERFLO	2X2	32	45	0.5	N/A	3,5
PP7	AGITATOR DRAIN DOWN PUMP REFER: 1/SP6.05	PENTAIR	INTELLIFLO I1	2.5X2.5	120	40	3	N/A	1,3,4,5

NOTE:
1. THE MANUFACTURER INDICATED IS BASIS OF DESIGN. PUMP MANUFACTURERS: ITT MARLOW, GRISWOLD, PACO OR AURORA SHALL BE CONSIDERED EQUAL PROVIDED THEY MEET SPECIFICATIONS AS INDICATED IN BID DOCUMENTS.
2. PROVIDE WITH 460 VOLT, 3 PHASE, 60HZ, 1750 RPM MOTOR.
3. PROVIDE WITH CHECK VALVE.
4. PROVIDE VARIABLE FREQUENCY DRIVE.
5. PROVIDE WITH 230 VOLT, 1 PHASE, 60HZ, 3450 RPM MOTOR.

CHEMICAL FEED PUMP SCHEDULE

ID	DESCRIPTION	MANUFACTURER	MODEL	TUBE #	HP	FLOW	NOTES
PP7	CHLORINATION SYSTEM PUMP REFER: 6/SP6.03	ACCUTAB	3070	N/A	1	64.8 LBS/DAY	3
PP8	CHLORINATION SYSTEM PUMP REFER: 6/SP6.03	ACCUTAB	3070	N/A	1	64.8 LBS/DAY	3
PP9	ACID FEED PUMP REFER: 3/SP6.03	STENNER	45M	3	FRAC	22 GAL/DAY	1,2,3
PP10	ACID FEED PUMP REFER: 3/SP6.03	STENNER	45M	3	FRAC	22 GAL/DAY	1,2,3
PP11	ACID FEED PUMP (ALTERNATE #2) REFER: 3/SP6.03	STENNER	45M	1	FRAC	22 GAL/DAY	1,2,3

NOTE:
1. THE MANUFACTURER INDICATED IS BASIS OF DESIGN. ALTERNATE MANUFACTURER: LMI OR APPROVED EQUAL.
2. PROVIDE WITH 120 VOLT, SINGLE PHASE, ADJUSTABLE FEED.
3. INTERLOCK WITH POOL RECIRCULATION PUMP.

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

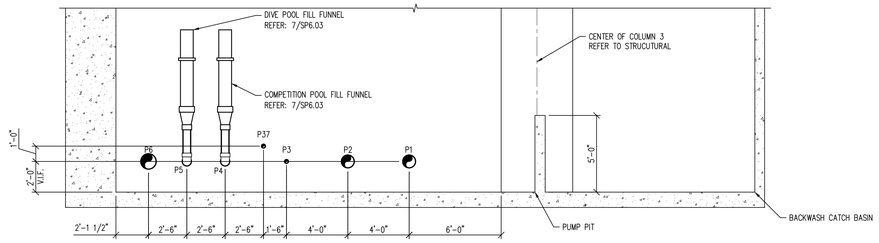
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

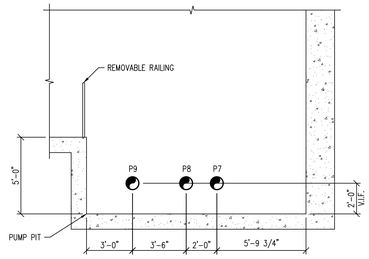
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

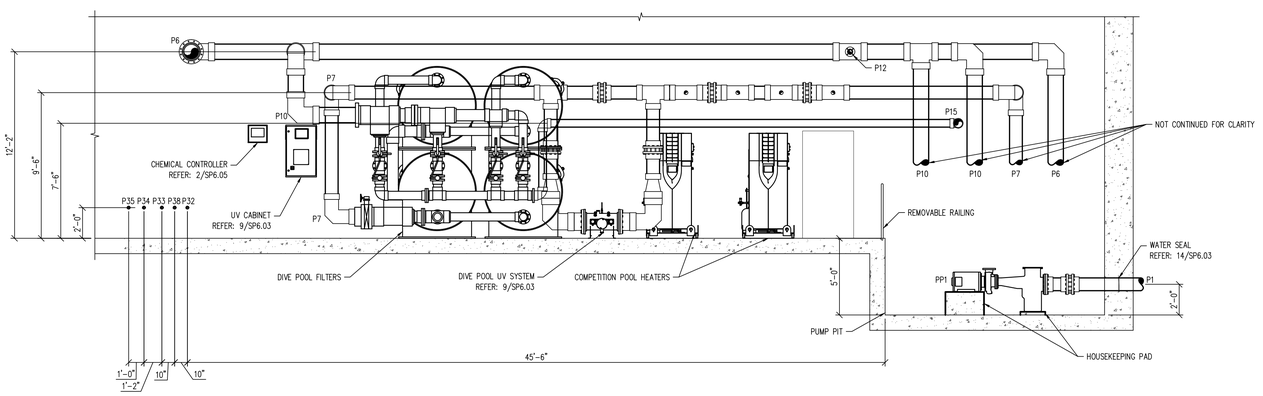
SP6.00
POOL MECHANICAL ROOM PLAN



1 SP6.01 **POOL MECHANICAL ROOM SECTION**
1/4" = 1'-0"



2 SP6.01 **POOL MECHANICAL ROOM SECTION**
1/4" = 1'-0"



3 SP6.01 **POOL MECHANICAL ROOM SECTION**
1/4" = 1'-0"

PIPE SCHEDULE

ID	DESCRIPTION
P1	10" FROM COMPETITION POOL MAIN DRAINS TO PP1
P2	10" FROM COMPETITION POOL MAIN DRAINS TO PP2
P3	3" FROM PP5 TO DIVE POOL AGITATORS
P4	6" FROM FILL FUNNEL TO COMPETITION POOL SURGE TANK
P5	6" FROM FILL FUNNEL TO DIVE POOL SURGE TANK
P6	12" FROM COMPETITION POOL FILTERS TO POOL INLETS
P7	10" FROM DIVE POOL FILTERS TO POOL INLETS
P8	10" FROM DIVE POOL MAIN DRAINS TO PP3
P9	10" FROM DIVE POOL MAIN DRAINS TO PP4
P10	12" FROM PP3 & PP4 TO DIVE POOL FILTERS
P11	14" FROM PP1 & PP2 TO COMPETITION POOL FILTERS
P12	3" FROM P10 TO BACKWASH CATCH BASIN
P13	3" FROM P11 TO BACKWASH CATCH BASIN
P14	6" FROM COMPETITION POOL FILTERS TO BACKWASH CATCH BASIN
P15	6" FROM DIVE POOL FILTERS TO BACKWASH CATCH BASIN
P16	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P17	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P18	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P19	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P20	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P21	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P22	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P23	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P24	3" FROM P6 TO COMPETITION POOL HEATER
P25	3" FROM COMPETITION POOL HEATER TO P6
P26	2" FROM P32 TO ENDLESS POOL HEATER
P27	2" FROM EMDLESS POOL HEATER TO P32
P28	3" FROM P7 TO DIVE POOL HEATER
P29	3" FROM DIVE POOL HEATER TO P7
P30	2" COMPETITION POOL SURGE TANK VENT (REFER TO MECHANICAL)
P31	2" DIVE POOL SURGE TANK VENT (REFER TO MECHANICAL)
P32	2" FROM ENDLESS POOL MAIN DRAINS TO PP5 (ALTERNATE #2)
P33	2" FROM ENDLESS POOL FILTER TO POOL INLETS (ALTERNATE #2)
P34	2" FROM ENDLESS POOL MAIN DRAINS TO PP6 (ALTERNATE #2)
P35	2" FROM PP6 TO ENDLESS POOL HYDRO JETS (ALTERNATE #2)
P36	2" FROM PP5 TO ENDLESS POOL FILTER (ALTERNATE #2)
P37	3" FROM PP7 TO DIVE POOL AGITATORS
P38	2" FROM ENDLESS POOL SKIMMERS TO P32 (ALTERNATE #2)

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION
DOCUMENTS

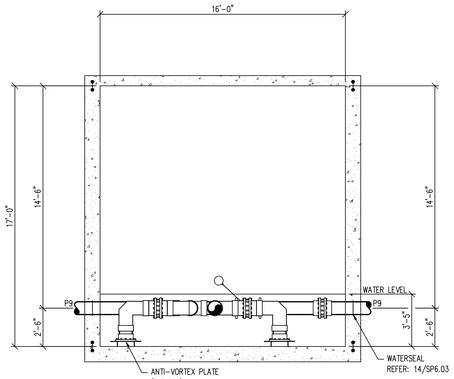
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

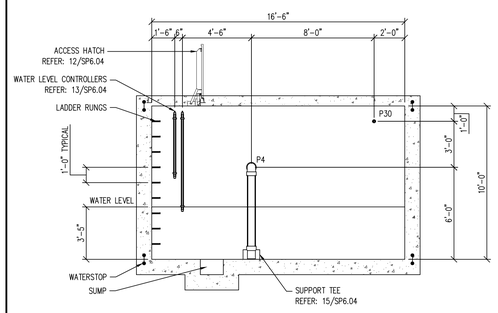
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

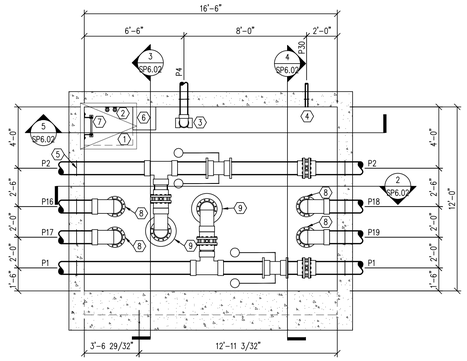
SP6.01
POOL MECHANICAL
ROOM SECTIONS



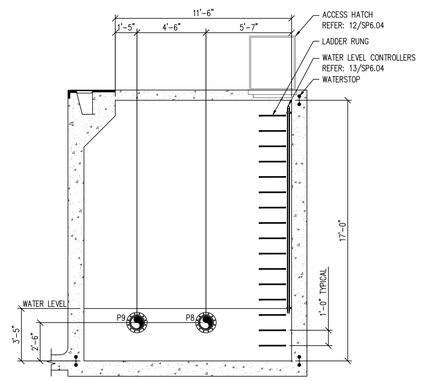
9 SP6.02 **DIVE POOL SURGE TANK SECTION**
1/4" = 1'-0"



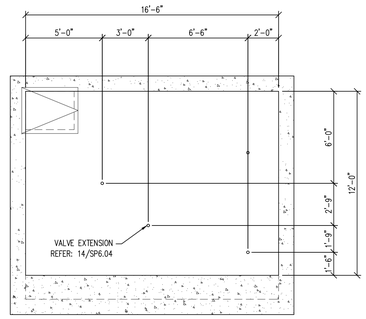
5 SP6.02 **COMPETITION POOL SURGE TANK SECTION**
1/4" = 1'-0"



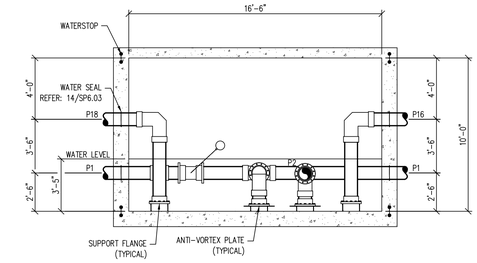
1 SP6.02 **COMPETITION POOL SURGE TANK PLAN**
1/4" = 1'-0"



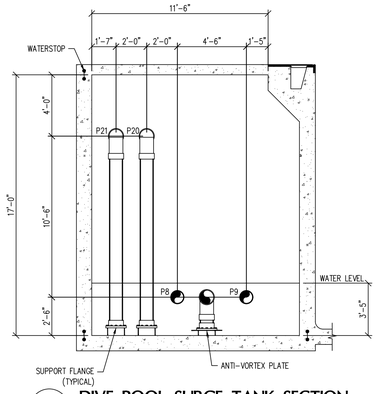
10 SP6.02 **DIVE POOL SURGE TANK SECTION**
1/4" = 1'-0"



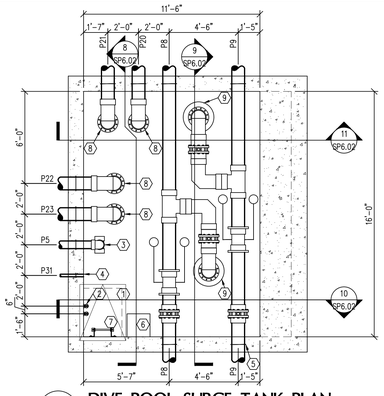
6 SP6.02 **COMPETITION POOL VALVE EXTENSION PENETRATION PLAN**
1/4" = 1'-0"



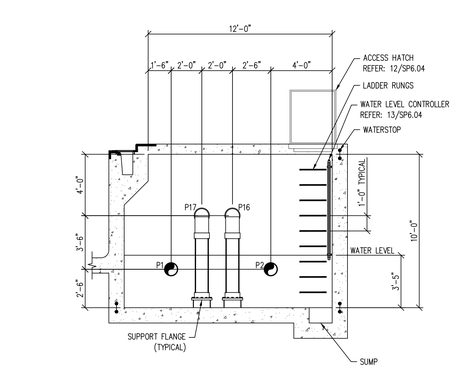
2 SP6.02 **COMPETITION POOL SURGE TANK SECTION**
1/4" = 1'-0"



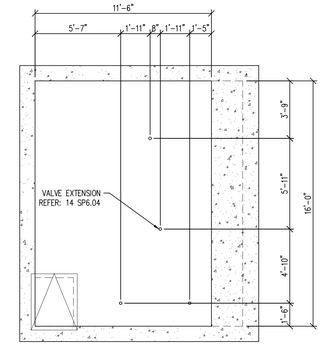
11 SP6.02 **DIVE POOL SURGE TANK SECTION**
1/4" = 1'-0"



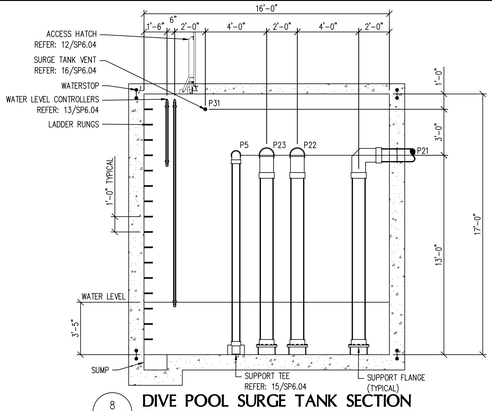
7 SP6.02 **DIVE POOL SURGE TANK PLAN**
1/4" = 1'-0"



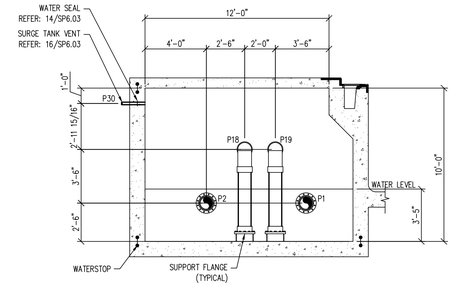
3 SP6.02 **COMPETITION POOL SURGE TANK SECTION**
1/4" = 1'-0"



12 SP6.02 **DIVE POOL VALVE EXTENSION PENETRATION PLAN**
1/4" = 1'-0"



8 SP6.02 **DIVE POOL SURGE TANK SECTION**
1/4" = 1'-0"



4 SP6.02 **COMPETITION POOL SURGE TANK SECTION**
1/4" = 1'-0"

SURGE TANK NOTES

1. A WATERPROOFING COATING SHALL BE PROVIDED TO ALL INTERIOR SURFACES OF SURGE TANK INCLUDING LID.
2. PROVIDE WATER TIGHT PIPE PENETRATIONS AND INTERFACES WITHIN THE SURGE TANK.
3. REFER TO POOL OR BUILDING STRUCTURAL DRAWINGS FOR SURGE TANK STRUCTURAL SHELL DESIGN.
4. SLEEVES IN SLAB OVER SURGE TANK FOR VALVE EXTENSIONS POSITIONED DIRECTLY ABOVE SURGE TANK VALVES BELOW SHALL BE COORDINATED.
5. DRILL 1" DIAMETER HOLE ON TOP OF ELBOW. TYPICAL ALL GUTTER DROPOUT LINES.
6. LADDER RUNGS SHALL BE PROVIDED.
7. REFER TO POOL OR BUILDING STRUCTURAL DRAWINGS FOR WATER STOPS.
8. PVC ANTI-VORTEX PLATE SHALL BE MINIMUM 2.5 TIMES CONNECTING PIPE DIAMETER UP TO 24" AND 4" A.F.F.
9. SUPPORT FLANGE WITH FOUR (4) LEGS EQUAL TO NOMINAL PIPE DIAMETER, BUT NOT LESS THAN 6" A.F.F.
10. PROVIDE 18"x18"x12" DEEP SUMP LOCATED NEAR ACCESS HATCH.

PUMP SCHEDULE

ID	DESCRIPTION	MANUFACTURER	MODEL	SIZE	GPM	TDH	HP	NPSHR	NOTES
PP1	COMPETITION POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	50123LC	6X5	1,150	78	30	9.59	1,2,3,4
PP2	COMPETITION POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	50123LC	6X5	1,150	78	30	9.59	1,2,3,4
PP3	DIVE POOL RECIRCULATION PUMP 1 REFER: 1/SP6.03	PACO	50123LC	6X5	1,000	82	30	8.77	1,2,3,4
PP4	DIVE POOL RECIRCULATION PUMP 2 REFER: 1/SP6.03	PACO	50123LC	6X5	1,000	82	30	8.77	1,2,3,4
PP5	ENDLESS POOL RECIRCULATION PUMP (ALTERNATE #2)	PENTAIR	INTELLIFLO I1	2.5X2.5	28	70	3	N/A	1,3,4,5
PP6	ENDLESS POOL HYDRO PUMP (ALTERNATE #2)	PENTAIR	WHISPERFLO	2X2	32	45	0.5	N/A	3,5
PP7	AGITATOR DRAIN DOWN PUMP REFER: 1/SP6.05	PENTAIR	INTELLIFLO I1	2.5X2.5	120	40	3	N/A	1,3,4,5

NOTE:
1. THE MANUFACTURER INDICATED IS BASIS OF DESIGN. PUMP MANUFACTURERS: ITT MARLOW, GRISWOLD, PACO OR AURORA SHALL BE CONSIDERED EQUAL PROVIDED THEY MEET SPECIFICATIONS AS INDICATED IN BID DOCUMENTS.
2. PROVIDE WITH 460 VOLT, 3 PHASE, 60HZ, 1750 RPM MOTOR.
3. PROVIDE WITH CHECK VALVE.
4. PROVIDE VARIABLE FREQUENCY DRIVE.
5. PROVIDE WITH 230 VOLT, 1 PHASE, 60HZ, 3450 RPM MOTOR.

PIPE SCHEDULE

ID	DESCRIPTION
P1	10" FROM COMPETITION POOL MAIN DRAINS TO PP1
P2	10" FROM COMPETITION POOL MAIN DRAINS TO PP2
P3	3" FROM PP5 TO DIVE POOL AGITATORS
P4	6" FROM FILL FUNNEL TO COMPETITION POOL SURGE TANK
P5	6" FROM FILL FUNNEL TO DIVE POOL SURGE TANK
P6	12" FROM COMPETITION POOL FILTERS TO POOL INLETS
P7	10" FROM DIVE POOL FILTERS TO POOL INLETS
P8	10" FROM DIVE POOL MAIN DRAINS TO PP3
P9	10" FROM DIVE POOL MAIN DRAINS TO PP4
P10	12" FROM PP3 & PP4 TO DIVE POOL FILTERS
P11	14" FROM PP1 & PP2 TO COMPETITION POOL FILTERS
P12	3" FROM P10 TO BACKWASH CATCH BASIN
P13	3" FROM P11 TO BACKWASH CATCH BASIN
P14	6" FROM COMPETITION POOL FILTERS TO BACKWASH CATCH BASIN
P15	6" FROM DIVE POOL FILTERS TO BACKWASH CATCH BASIN
P16	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P17	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P18	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P19	10" FROM GUTTER DROPOUT BOXES TO COMPETITION POOL SURGE TANK
P20	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P21	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P22	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P23	10" FROM GUTTER DROPOUT BOX TO DIVE POOL SURGE TANK
P24	3" FROM P6 TO COMPETITION POOL HEATER
P25	3" FROM COMPETITION POOL HEATER TO P6
P26	2" FROM P32 TO ENDLESS POOL HEATER
P27	2" FROM EMDLESS POOL HEATER TO P32
P28	3" FROM P7 TO DIVE POOL HEATER
P29	3" FROM DIVE POOL HEATER TO P7
P30	2" COMPETITION POOL SURGE TANK VENT (REFER TO MECHANICAL)
P31	2" DIVE POOL SURGE TANK VENT (REFER TO MECHANICAL)
P32	2" FROM ENDLESS POOL MAIN DRAINS TO PP5 (ALTERNATE #2)
P33	2" FROM ENDLESS POOL FILTER TO POOL INLETS (ALTERNATE #2)
P34	2" FROM ENDLESS POOL MAIN DRAINS TO PP6 (ALTERNATE #2)
P35	2" FROM PP6 TO ENDLESS POOL HYDRO JETS (ALTERNATE #2)
P36	2" FROM PP5 TO ENDLESS POOL FILTER (ALTERNATE #2)
P37	3" FROM PP7 TO DIVE POOL AGITATORS
P38	2" FROM ENDLESS POOL SKIMMERS TO P32 (ALTERNATE #2)

EQUIPMENT SCHEDULE

ID	ITEM
1	ACCESS HATCH REFER: 2/SP6.04
2	WATER LEVEL CONTROLLER(S) REFER: 13/SP6.04
3	SUPPORT TEE REFER: 15/SP6.04
4	SURGE TANK VENT REFER: 16/SP6.04
5	WATER SEAL REFER: 14/SP6.03
6	SUMP
7	LADDER RUNGS
8	SUPPORT FLANGE
9	ANTI-VORTEX PLATE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

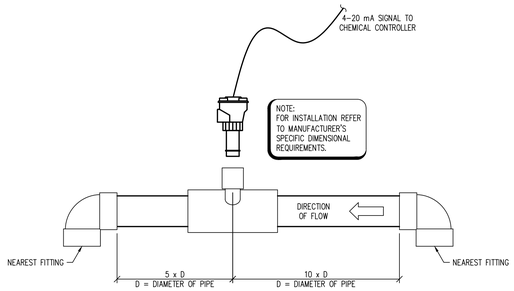
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

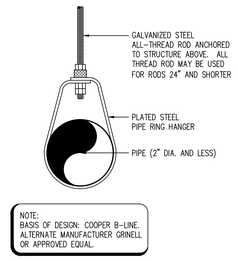
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

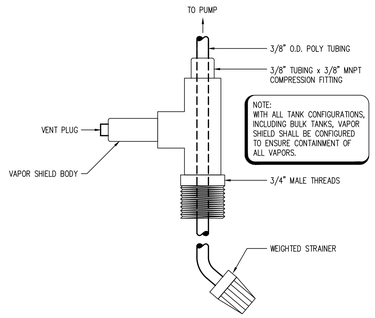
SP6.02
SURGE TANK PLANS & SECTIONS



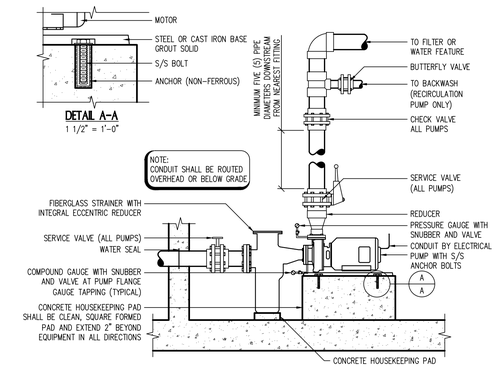
12 SP6.03 **FLOW METER SENSOR**
3/4" = 1'-0"



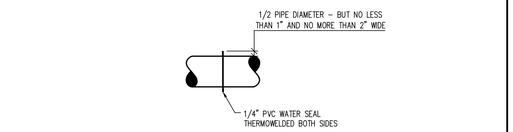
8 SP6.03 **SWIVEL RING PIPE HANGER**
1 1/2" = 1'-0"



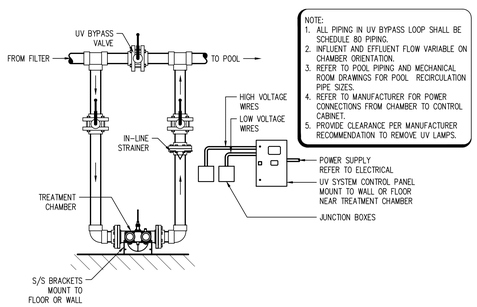
5 SP6.03 **ACID VENT PIPING**
6" = 1'-0"



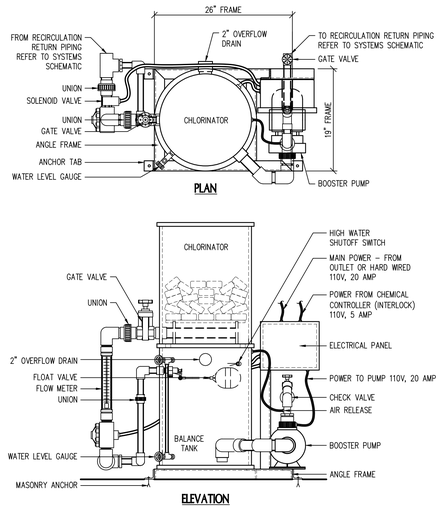
1 SP6.03 **TYPICAL PUMP DETAIL**
1/2" = 1'-0"



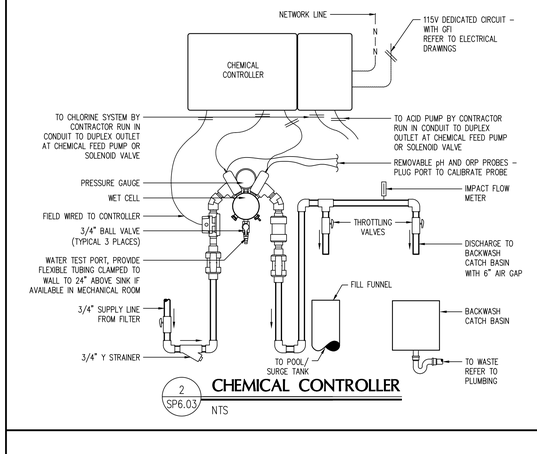
13 SP6.03 **IMPACT FLOW METER**
3/4" = 1'-0"



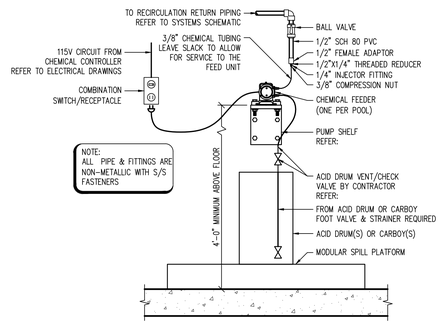
9 SP6.03 **UV TREATMENT SYSTEM**
1/2" = 1'-0"



6 SP6.03 **CHLORINATION SYSTEM**
1" = 1'-0"

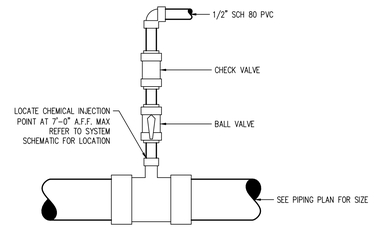


2 SP6.03 **CHEMICAL CONTROLLER**
NTS

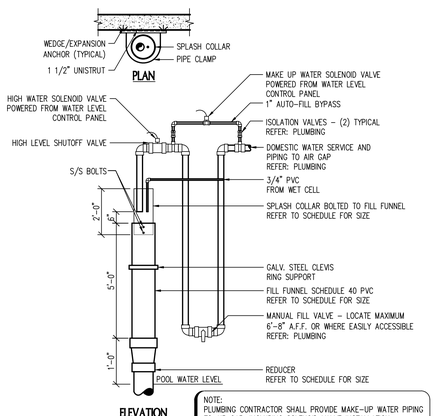


3 SP6.03 **ACID SYSTEM**
3/4" = 1'-0"

14 SP6.03 **WATER SEAL**
1" = 1'-0"

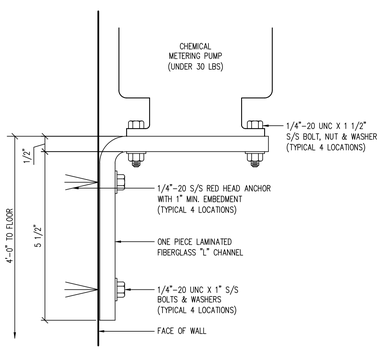


10 SP6.03 **CHEMICAL TAP AND VALVE**
1" = 1'-0"

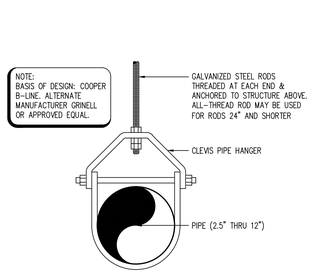


FILL FUNNEL SCHEDULE					
POOL	FRESH WATER SUPPLY GPM (MIN.)	FILL FUNNEL SIZE	REDUCER SIZE	SPLASH COLLAR SIZE	FILL LINE SIZE TO POOL
COMPETITION	161	10	10X6	8	6
DIVE	163	10	10X6	8	6

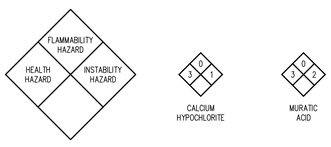
7 SP6.03 **FILL FUNNEL**
3/8" = 1'-0"



4 SP6.03 **CHEMICAL PUMP SHELF**
6" = 1'-0"



15 SP6.03 **CLEVIS PIPE HANGER**
1 1/2" = 1'-0"



RATING EXPLANATION GUIDE			
RATING	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD
4	CAN BE LETHAL	BELOW 73 DEGREES F	MAY EXPLODE AT NORMAL TEMPERATURES AND PRESSURES
3	CAN CAUSE SERIOUS OR PERMANENT INJURY	ABOVE 73 DEGREES, BELOW 100 DEGREES F	MAY EXPLODE AT HIGH TEMPERATURE OR SHOCK
2	CAN CAUSE TEMPORARY INCAPACITATION OR RESIDUAL INJURY	ABOVE 100 DEGREES F, BELOW 200 DEGREES F	VIOLENT CHEMICAL CHANGE AT HIGH TEMPERATURES OR PRESSURES
1	CAN CAUSE SIGNIFICANT IRRITATION	ABOVE 200 DEGREES F	NORMALLY STABLE. HIGH TEMPERATURES MAKE UNSTABLE
0	NO HAZARD	WILL NOT BURN	STABLE

CONFIRM SIGNAGE WITH LOCAL FIRE MARSHAL AND/OR BUILDING CODES PRIOR TO INSTALLATION.

11 SP6.03 **HAZARD SIGNAGE**
NTS

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			
4			

CONSTRUCTION DOCUMENTS

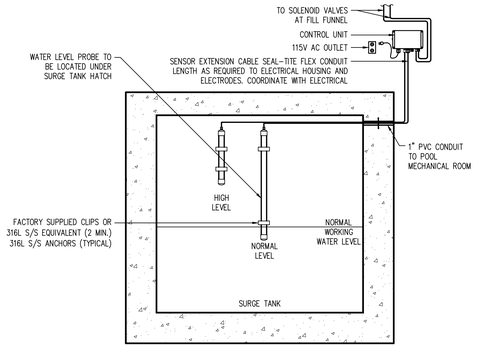
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

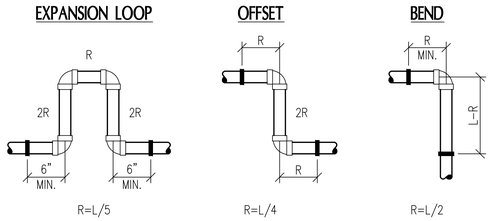
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 071805
DATE 06/07/2019
REVISED

SP6.03
POOL MECHANICAL DETAILS

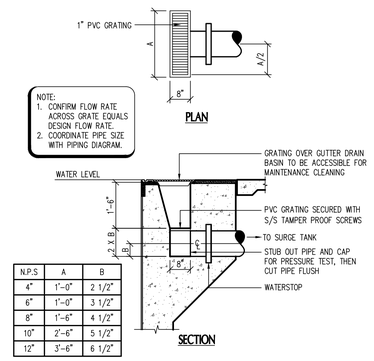


13 SP6.04 **WATER LEVEL CONTROLLER**
3/4" = 1'-0"



NOTE:
LENGTH (L) IS MAXIMUM CONSTRAINED LENGTH OF PIPE RUN BETWEEN JOINTS, BENDS, FLANGES, REDUCERS, ETC.

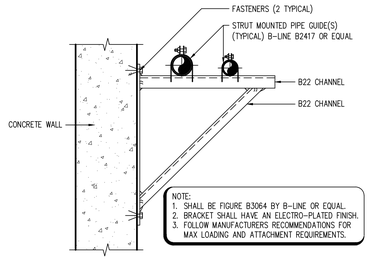
9 SP6.04 **EXPANSION LOOP**
3/8" = 1'-0"



NOTE:
1. CONFIRM FLOW RATE ACROSS GRATE EQUALS DESIGN FLOW RATE.
2. COORDINATE PIPE SIZE WITH PIPING DIAGRAM.

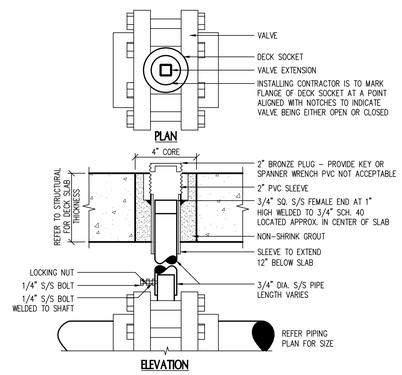
N.P.S	A	B
4"	1'-0"	2 1/2"
6"	1'-0"	3 1/2"
8"	1'-6"	4 1/2"
10"	2'-6"	5 1/2"
12"	3'-6"	6 1/2"

5 SP6.04 **DIVE POOL DROPOUT BOX**
1/2" = 1'-0"

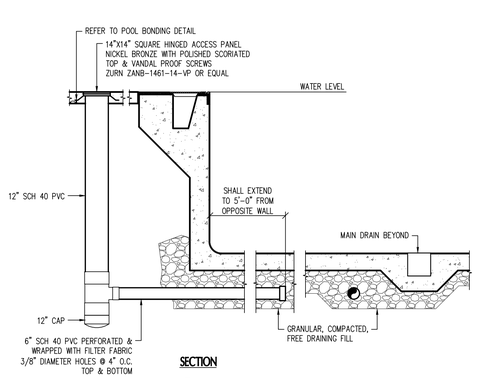


NOTE:
1. SHALL BE FIGURE B3064 BY B-LINE OR EQUAL.
2. BRACKET SHALL HAVE AN ELECTRO-PLATED FINISH.
3. FOLLOW MANUFACTURERS RECOMMENDATIONS FOR MAX LOADING AND ATTACHMENT REQUIREMENTS.

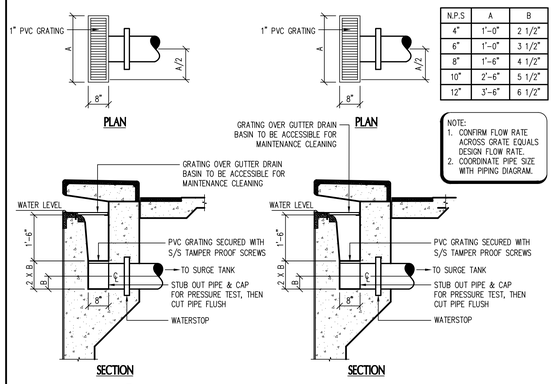
1 SP6.04 **ADJUSTABLE STRUT BRACKET**
3" = 1'-0"



14 SP6.04 **VALVE EXTENSION**
3" = 1'-0"



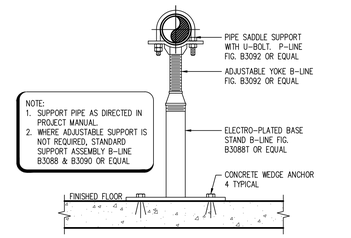
10 SP6.04 **SIGHT SUMP**
3/8" = 1'-0"



N.P.S	A	B
4"	1'-0"	2 1/2"
6"	1'-0"	3 1/2"
8"	1'-6"	4 1/2"
10"	2'-6"	5 1/2"
12"	3'-6"	6 1/2"

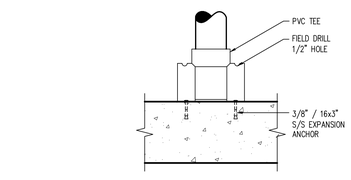
NOTE:
1. CONFIRM FLOW RATE ACROSS GRATE EQUALS DESIGN FLOW RATE.
2. COORDINATE PIPE SIZE WITH PIPING DIAGRAM.

6 SP6.04 **COMPETITION POOL DROPOUT BOX**
1/2" = 1'-0"

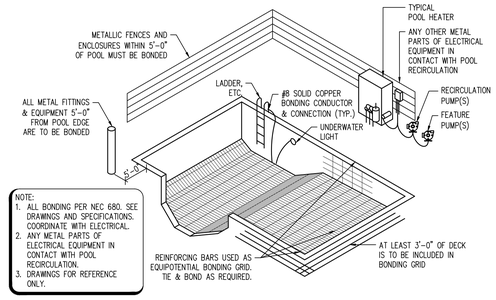


NOTE:
1. SUPPORT PIPE AS DIRECTED IN PROJECT MANUAL.
2. WHERE ADJUSTABLE SUPPORT IS NOT REQUIRED, STANDARD SUPPORT ASSEMBLY B-LINE B3088 & B3090 OR EQUAL

2 SP6.04 **FLOOR MOUNTED PIPE SUPPORT**
3" = 1'-0"



15 SP6.04 **SUPPORT TEE**
1" = 1'-0"



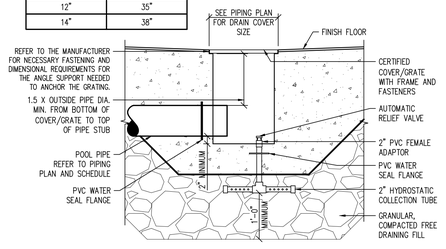
NOTE:
1. ALL BONDING PER NEC 680. SEE DRAWINGS AND SPECIFICATIONS. COORDINATE WITH ELECTRICAL.
2. ANY METAL PARTS OF ELECTRICAL EQUIPMENT IN CONTACT WITH POOL RECIRCULATION.
3. DRAWINGS FOR REFERENCE ONLY.

11 SP6.04 **TYPICAL POOL BONDING DETAIL**
NTS

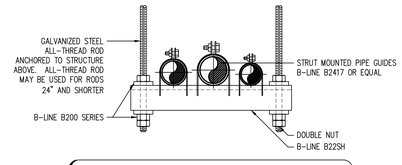
DRAIN DEPTH SCHEDULE

STUB SIZE (NPS)	MINIMUM DEPTH
3" AND UNDER	12"
4"	14.25"
6"	19.5"
8"	24.5"
10"	30"
12"	35"
14"	38"

NOTE:
1. ALL MAIN DRAINS SHALL BE CONSTRUCTED TO COMPLY WITH THE VIRGINIA GRAEME BAKER ACT AND ASME ANSI/APSP-16-2011.
2. MAIN DRAINS MAY USE MULTIPLE VGB COMPLIANT GRATES SECURELY FASTENED PER MANUFACTURER RECOMMENDATIONS.

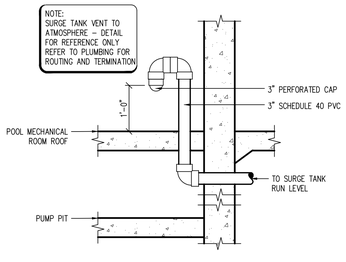


7 SP6.04 **MAIN DRAIN**
3/4" = 1'-0"

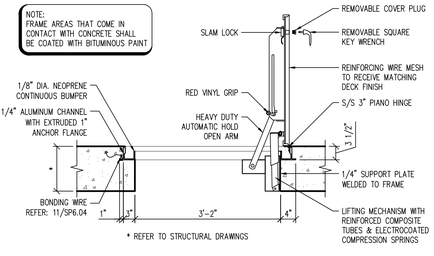


NOTE:
1. COOPER B-LINE (BASIS OF DESIGN) ALTERNATE MANUFACTURERS UNISTRUT OR PRE APPROVED EQUAL.
2. REFER TO THE PROJECT MANUAL FOR FINISH REQUIREMENT.
3. CONTRACTOR SHALL FOLLOW ALL RECOMMENDATIONS FROM MANUFACTURER.

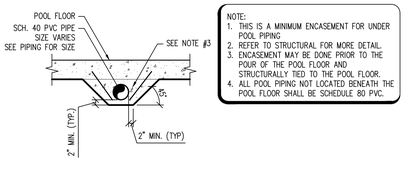
3 SP6.04 **TRAPEZE HANGER**
3" = 1'-0"



16 SP6.04 **SURGE TANK VENT**
3/4" = 1'-0"

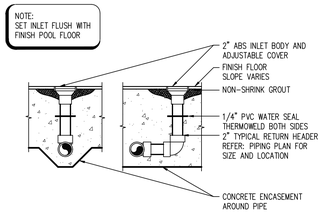


12 SP6.04 **SURGE TANK ACCESS HATCH**
3/4" = 1'-0"



NOTE:
1. THIS IS A MINIMUM ENCASEMENT FOR UNDER POOL PIPING
2. REFER TO STRUCTURAL FOR MORE DETAIL.
3. ENCASEMENT MAY BE DONE PRIOR TO THE POUR OF THE POOL FLOOR AND STRUCTURALLY TIED TO THE POOL FLOOR.
4. ALL POOL PIPING NOT LOCATED BENEATH THE POOL FLOOR SHALL BE SCHEDULE 80 PVC.

8 SP6.04 **CONCRETE ENCASED PIPE**
1/2" = 1'-0"



NOTE:
SET INLET FLUSH WITH FINISH POOL FLOOR

4 SP6.04 **FLOOR INLET**
1" = 1'-0"

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

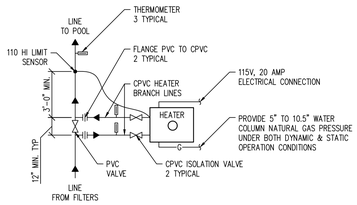
PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

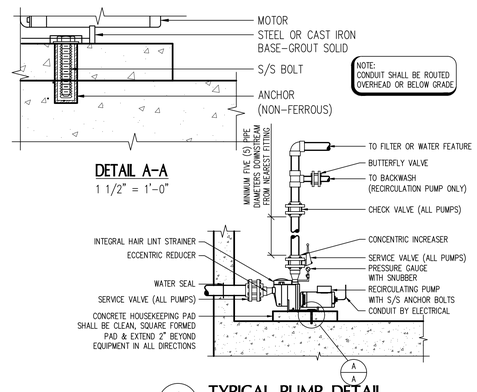
PROJECT	971805
DATE	06/07/2019
REVISED	

SP6.04
POOL MECHANICAL ROOM DEAILS

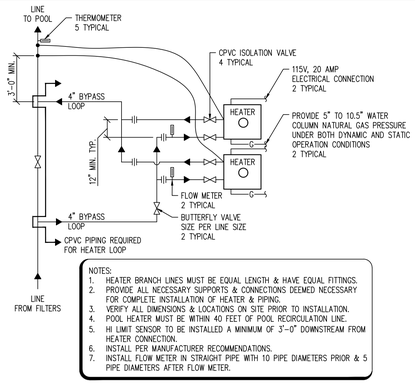


NOTES:
1. HEATER BRANCH LINES MUST BE EQUAL LENGTH & HAVE EQUAL FITTINGS.
2. PROVIDE ALL NECESSARY SUPPORTS & CONNECTIONS DEEMED NECESSARY FOR COMPLETE INSTALLATION OF HEATER & PIPING.
3. VERIFY ALL DIMENSIONS & LOCATIONS ON SITE PRIOR TO INSTALLATION.
4. POOL HEATER MUST BE WITHIN 15 FEET OF POOL RECIRCULATION LINE.
5. HI LIMIT SENSOR TO BE INSTALLED A MINIMUM OF 3'-0" DOWNSTREAM FROM HEATER CONNECTION.
6. INSTALL PER MANUFACTURER RECOMMENDATIONS.

5 SP6.05 **HEATER PIPING SCHEMATIC**
NTS

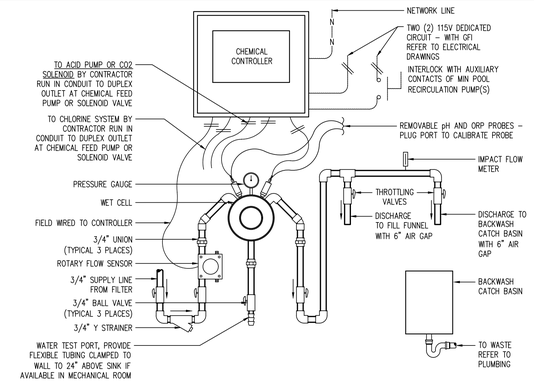


1 SP6.05 **TYPICAL PUMP DETAIL**
1/2" = 1'-0"

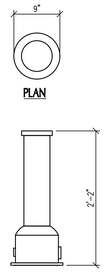


NOTES:
1. HEATER BRANCH LINES MUST BE EQUAL LENGTH & HAVE EQUAL FITTINGS.
2. PROVIDE ALL NECESSARY SUPPORTS & CONNECTIONS DEEMED NECESSARY FOR COMPLETE INSTALLATION OF HEATER & PIPING.
3. VERIFY ALL DIMENSIONS & LOCATIONS ON SITE PRIOR TO INSTALLATION.
4. POOL HEATER MUST BE WITHIN 40 FEET OF POOL RECIRCULATION LINE.
5. HI LIMIT SENSOR TO BE INSTALLED A MINIMUM OF 3'-0" DOWNSTREAM FROM HEATER CONNECTION.
6. INSTALL PER MANUFACTURER RECOMMENDATIONS.
7. INSTALL FLOW METER IN STRAIGHT PIPE WITH 10 PIPE DIAMETERS PRIOR & 5 PIPE DIAMETERS AFTER FLOW METER.

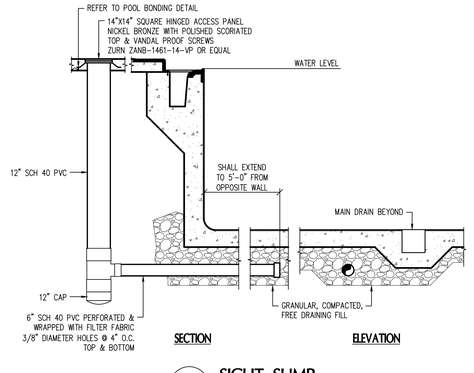
6 SP6.05 **HEATER PIPING SCHEMATIC**
NTS



2 SP6.05 **CHEMICAL CONTROLLER**
NTS



3 SP6.05 **CHLORINATION SYSTEM**
1" = 1'-0"



4 SP6.05 **SIGHT SUMP**
3/8" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			
2			
3			

CONSTRUCTION
DOCUMENTS

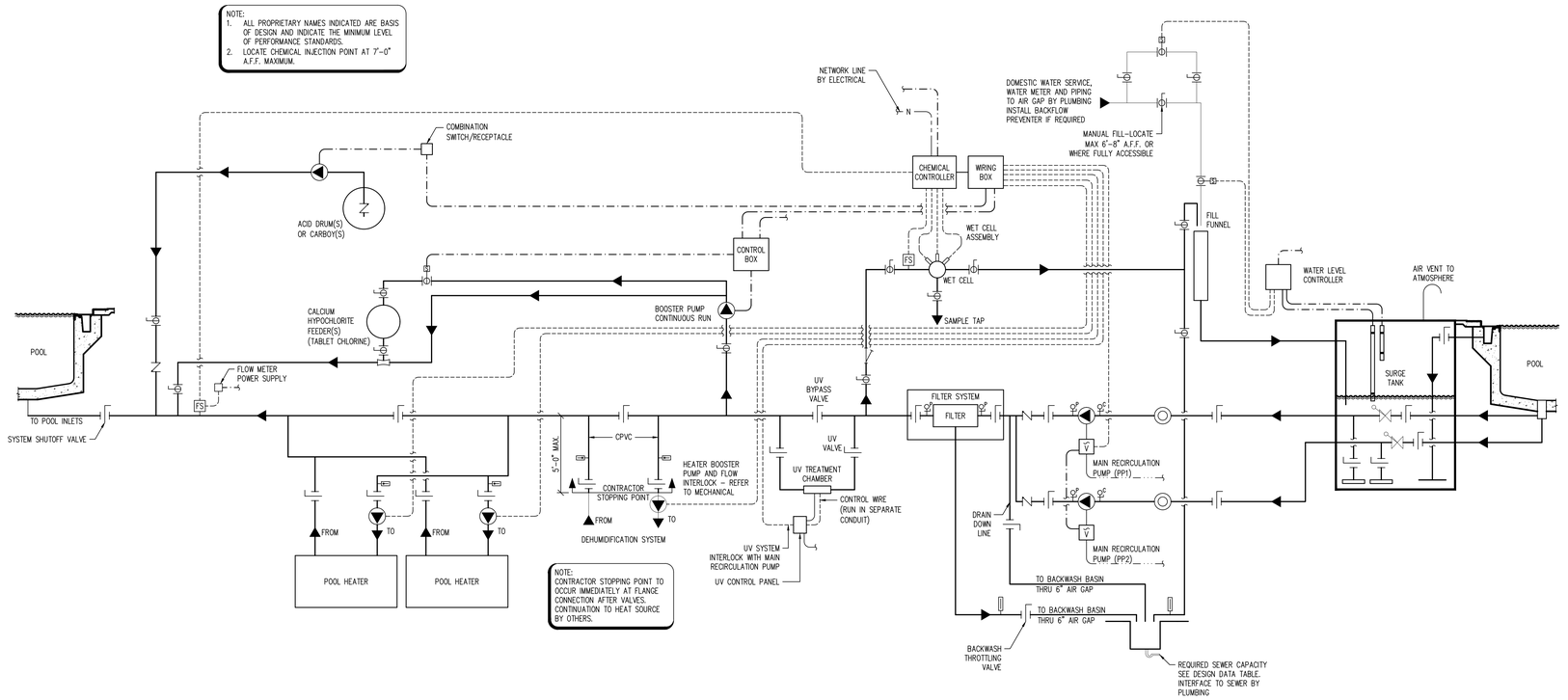
PROPOSED

CITY OF PHARR/PSJA
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

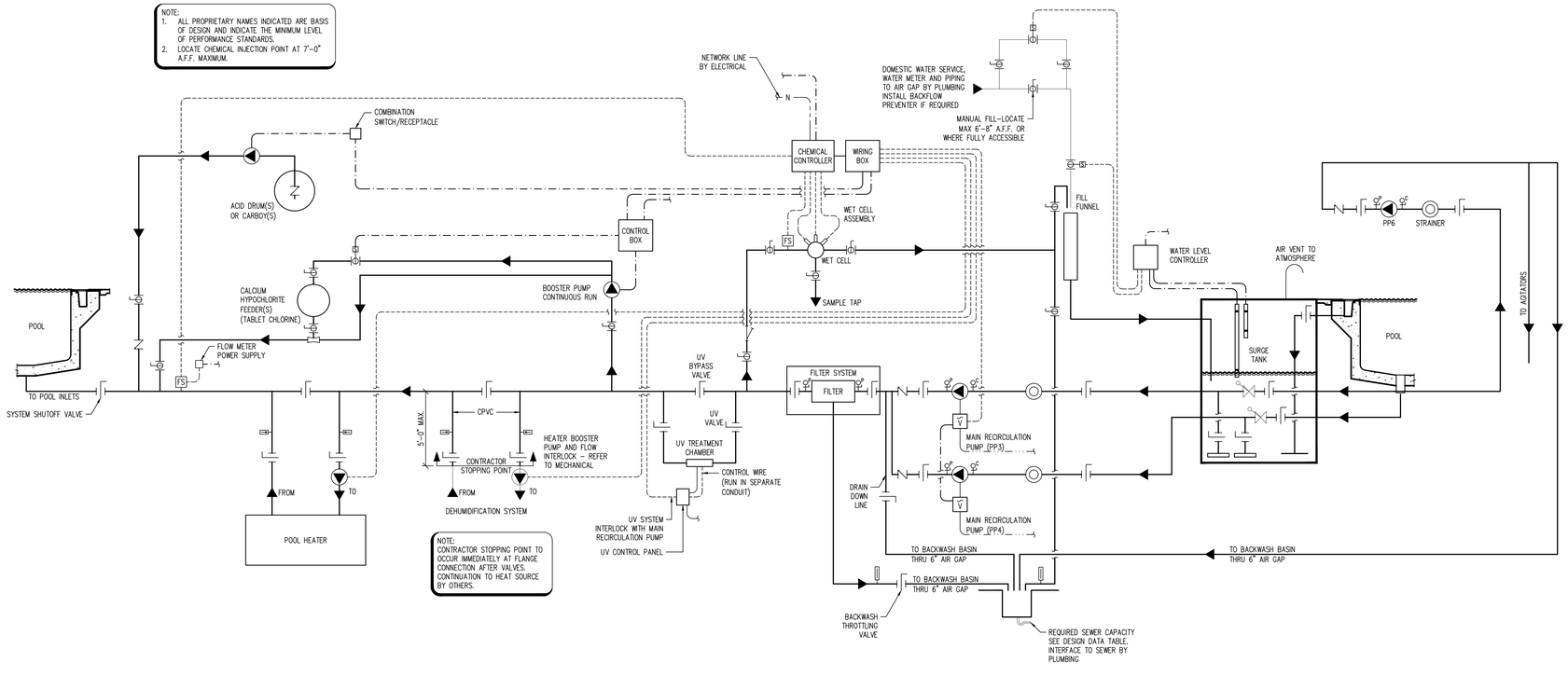
PROJECT 971805
DATE 06/07/2019
REVISED

SP6.05
POOL MECHANICAL
ROOM DEAILS



1 SP7.00 **COMPETITION POOL SYSTEMS SCHEMATIC**

NTS



2 SP7.00 **DIVE POOL SYSTEMS SCHEMATIC**

NTS

SCHEMATIC LEGEND

LEGEND	ITEM
	FLOW DIRECTION
	BUTTERFLY VALVE
	BALL VALVE
	GATE VALVE
	MODULATING FLOAT VALVE
PRV-1	PRESSURE REDUCING VALVE
S	SOLENOID VALVE
	SWING GATE CHECK VALVE
	THREE WAY VALVE
	DUCK BILLED VALVE
	PUMP
	HAIR AND LINT STRAINER
	"Y" STRAINER
F	FLOW METER
FI	FLOW INTERLOCK
FS	FLOW SENSOR
	IMPACT FLOW METER
	VENTURI FLOW METER
W	WATER METER
AV	AUTOMATIC AIR VENT
MV	MANUAL AIR VENT
P	PRESSURE GAUGE AND COCK
PC	COMPOUND GAUGE AND COCK
	DIGITAL TEMP SENSOR
	THERMOMETER
G	GEAR
A	PNEUMATIC ACTUATOR
S	SOLENOID
	POWER CORD
	FLOW CONTROL VALVE
V	VARIABLE FREQUENCY DRIVE
R	REMOTE START/STOP
E	EMERGENCY STOP
	LOW VOLTAGE CONTROL
	WATER LINE
	1 PHASE POWER
	3 PHASE POWER
	VENT LINE
	CO_2 LINE
N	NETWORK LINE

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION

CONSTRUCTION DOCUMENTS

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

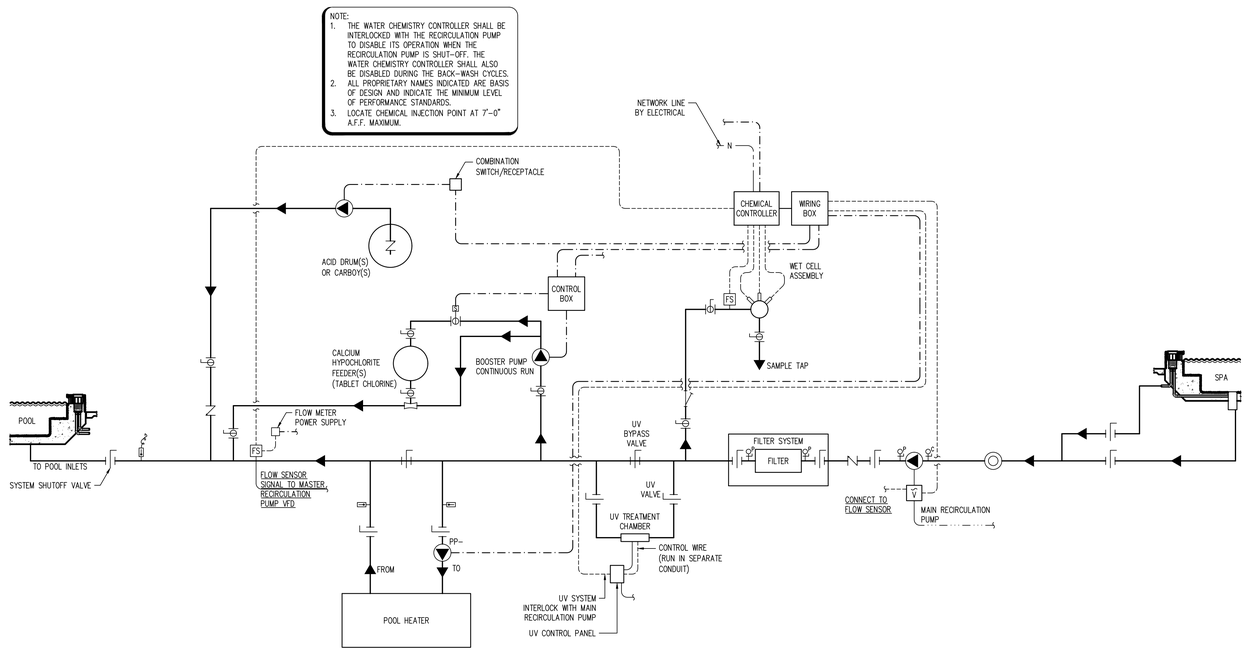
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

SP7.00

COMPETITION & DIVE POOL SYSTEMS SCHEMATICS

NOTE:
1. THE WATER CHEMISTRY CONTROLLER SHALL BE INTERLOCKED WITH THE RECIRCULATION PUMP TO DISABLE ITS OPERATION WHEN THE RECIRCULATION PUMP IS SHUT-OFF. THE WATER CHEMISTRY CONTROLLER SHALL ALSO BE DISABLED DURING THE BACK-WASH CYCLES.
2. ALL PROPRIETARY NAMES INDICATED ARE BASIS OF DESIGN AND INDICATE THE MINIMUM LEVEL OF PERFORMANCE STANDARDS.
3. LOCATE CHEMICAL INJECTION POINT AT 7'-0" A.F.F. MAXIMUM.



1 SP7.01 ENDLESS POOL SYSTEMS SCHEMATIC
NTS

SCHEMATIC LEGEND

LEGEND	ITEM
	FLOW DIRECTION
	BUTTERFLY VALVE
	BALL VALVE
	GATE VALVE
	MODULATING FLOAT VALVE
	PRESSURE REDUCING VALVE
S	SOLENOID VALVE
	SWING GATE CHECK VALVE
	THREE WAY VALVE
	DUCK BILLED VALVE
	PUMP
	HAIR AND LINT STRAINER
	"Y" STRAINER
F	FLOW METER
FI	FLOW INTERLOCK
FS	FLOW SENSOR
	IMPACT FLOW METER
	VENTURI FLOW METER
W	WATER METER
AV	AUTOMATIC AIR VENT
MV	MANUAL AIR VENT
P	PRESSURE GAUGE AND COCK
C	COMPOUND GAUGE AND COCK
	DIGITAL TEMP SENSOR
	THERMOMETER
G	GEAR
A	PNEUMATIC ACTUATOR
S	SOLENOID
	POWER CORD
	FLOW CONTROL VALVE
V	VARIABLE FREQUENCY DRIVE
R	REMOTE START/STOP
E	EMERGENCY STOP
	LOW VOLTAGE CONTROL
	WATER LINE
	1 PHASE POWER
	3 PHASE POWER
	VENT LINE
	CO_2 LINE
N	NETWORK LINE

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
DARREN BEVARD
104309
LICENSED
PROFESSIONAL ENGINEER

June 07, 2019

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

CONSTRUCTION DOCUMENTS

PROPOSED

CITY OF PHARR/PSJA AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

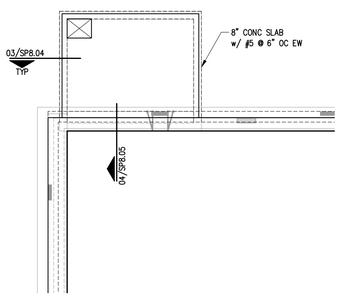
PROJECT	971805
DATE	06/07/2019
REVISED	

SP7.01
ENDLESS POOL SYSTEM SCHEMATICS

1717 East 116th Street, Suite 200
Carmel, Indiana 46032

317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

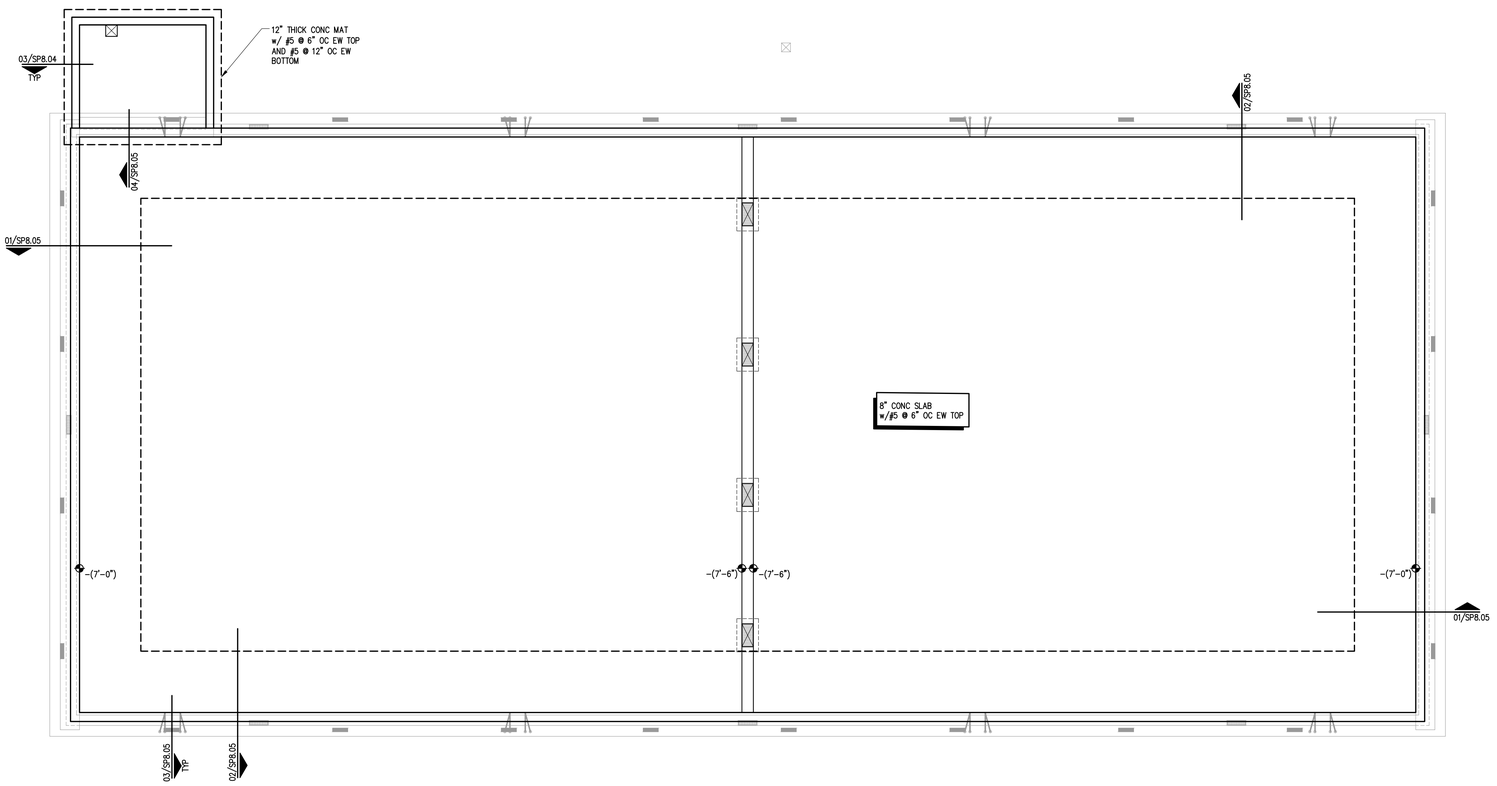
McCOMAS ENGINEERING
Structural Engineers



TOP SLAB PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH



COMPETITION POOL STRUCTURAL PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

PLAN NOTES:

1. WATER ELEVATION OF POOLS = +(0'-0"). SEE CIVIL DRAWINGS FOR CORRELATION TO ACTUAL SITE ELEVATION.
2. PROVIDE COMPACTED, FREE DRAINING FILL UNDER ALL POOL BOTTOM SLABS. SEE NOTE PF1 ON SHEET SP8.04.
3. PROVIDE ELECTRICAL GROUNDING FOR ALL REINFORCING AND EMBEDDED ITEMS, SEE ELECTRICAL DRAWINGS.
4. SEE SWIMMING POOL DRAWINGS FOR ALL DIMENSIONS NOT SHOWN.
5. WALLS ARE TYPICALLY SHOWN ON PLAN AT FOUNDATION LEVEL. SEE DETAILS & COORDINATE WITH SWIMMING POOL DRAWINGS FOR ALL WALL DETAIL ABOVE BASE SLAB.
6. ELEVATIONS ARE GIVEN RELATIVE TO POOL WATER SURFACE, UNO. COORDINATE WITH SWIMMING POOL DRAWINGS.
7. ALL ELEVATIONS ARE TO POOL FINISH.

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED PROFESSIONAL ENGINEER

CONSTRUCTION
DOCUMENTS

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT 971805
DATE 06/07/2019
REVISED

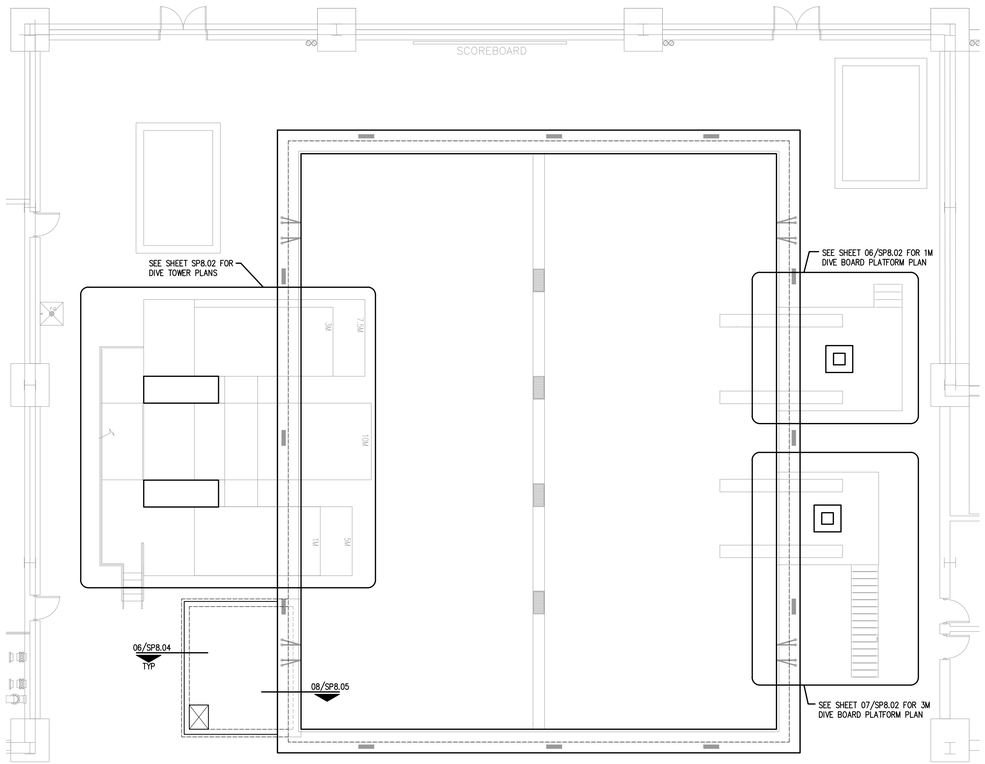
SP8.00

COMPETITION POOL
STRUCTURAL PLAN

1717 East 116th Street, Suite 200
Carmel, Indiana 46032

317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

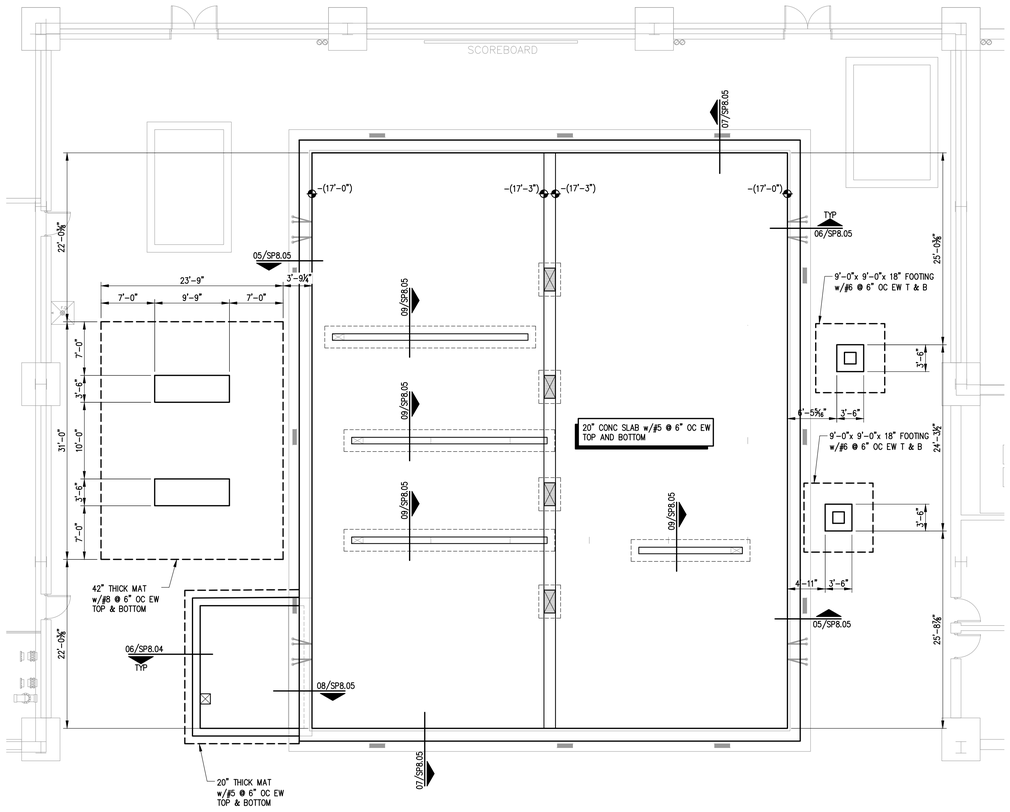
McCOMAS ENGINEERING
Structural Engineers



TOP SLAB PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH



DIVE POOL STRUCTURAL PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

PLAN NOTES:

1. WATER ELEVATION OF POOLS = +(0'-0"). SEE CIVIL DRAWINGS FOR CORRELATION TO ACTUAL SITE ELEVATION.
2. PROVIDE COMPACTED, FREE DRAINING FILL UNDER ALL POOL BOTTOM SLABS. SEE NOTE PF1 ON SHEET SP8.04.
3. PROVIDE ELECTRICAL GROUNDING FOR ALL REINFORCING AND EMBEDDED ITEMS, SEE ELECTRICAL DRAWINGS.
4. SEE SWIMMING POOL DRAWINGS FOR ALL DIMENSIONS NOT SHOWN.
5. WALLS ARE TYPICALLY SHOWN ON PLAN AT FOUNDATION LEVEL. SEE DETAILS & COORDINATE WITH SWIMMING POOL DRAWINGS FOR ALL WALL DETAIL ABOVE BASE SLAB.
6. ELEVATIONS ARE GIVEN RELATIVE TO POOL WATER SURFACE, UNO. COORDINATE WITH SWIMMING POOL DRAWINGS.
7. ALL ELEVATIONS ARE TO POOL FINISH.

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT	971805
DATE	06/07/2019
REVISED	

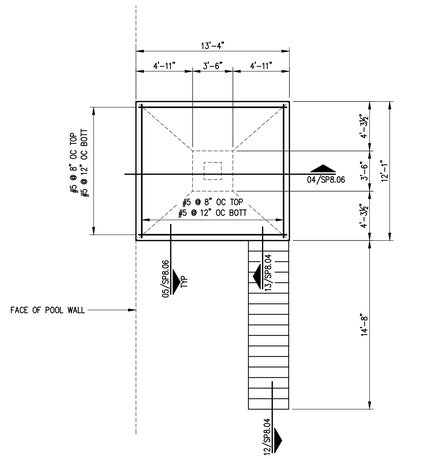
SP8.01

DIVE POOL STRUCTURAL PLAN

1717 East 116th Street, Suite 200
Carmel, Indiana 46032

317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

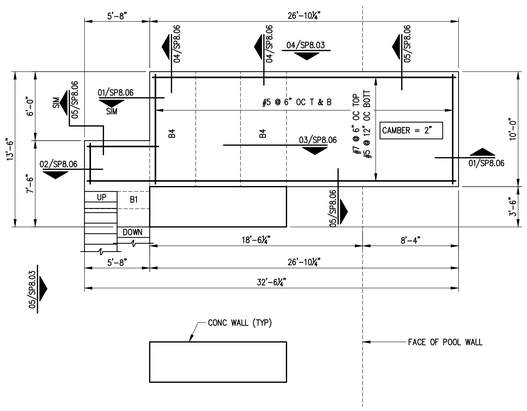
McCOMAS ENGINEERING
Structural Engineers



3M BOARD PLATFORM PLAN

SCALE: 3/16" = 1'-0"

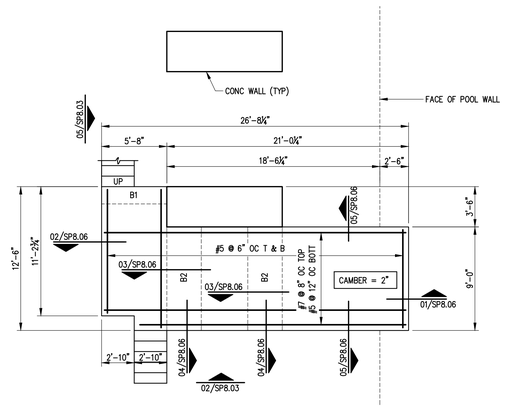
DIVE 1M — 07 SP8.02



7.5M PLATFORM PLAN

SCALE: 3/16" = 1'-0"

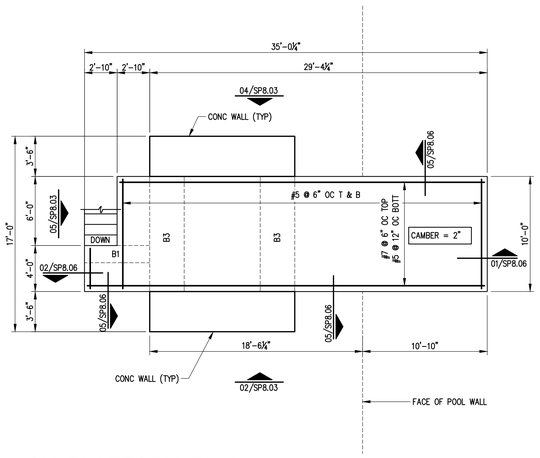
DIVE 7.5M — 04 SP8.02



1M PLATFORM PLAN

SCALE: 3/16" = 1'-0"

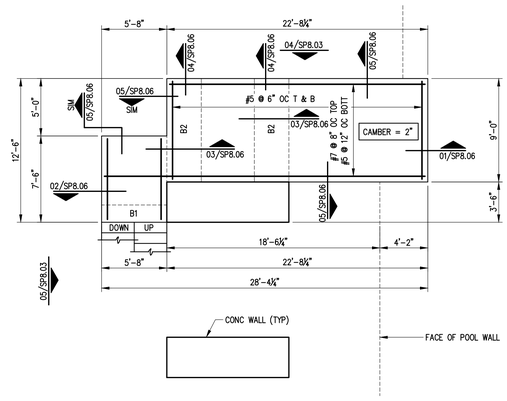
DIVE 1M — 01 SP8.02



10M PLATFORM PLAN

SCALE: 3/16" = 1'-0"

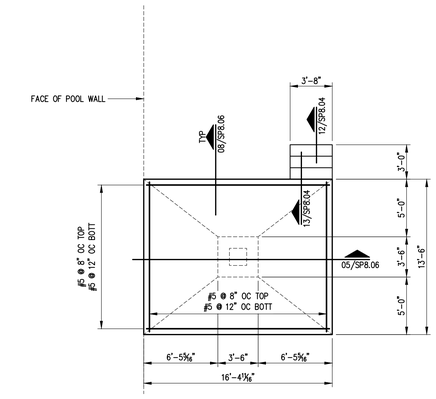
DIVE 10M — 05 SP8.02



3M PLATFORM PLAN

SCALE: 3/16" = 1'-0"

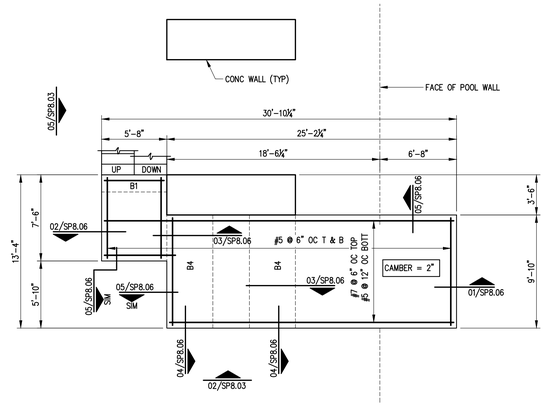
DIVE 3M — 02 SP8.02



1M BOARD PLATFORM PLAN

SCALE: 3/16" = 1'-0"

DIVE 1M — 06 SP8.02



5M PLATFORM PLAN

SCALE: 3/16" = 1'-0"

DIVE 5M — 03 SP8.02

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED
PROFESSIONAL ENGINEER

CONSTRUCTION
DOCUMENTS

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT 971805
DATE 06/07/2019
REVISED

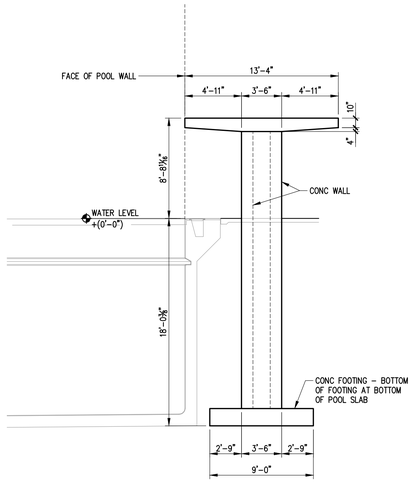
SP8.02

DIVE TOWER
STRUCTURAL PLANS

1717 East 116th Street, Suite 200
Carmel, Indiana 46032

317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

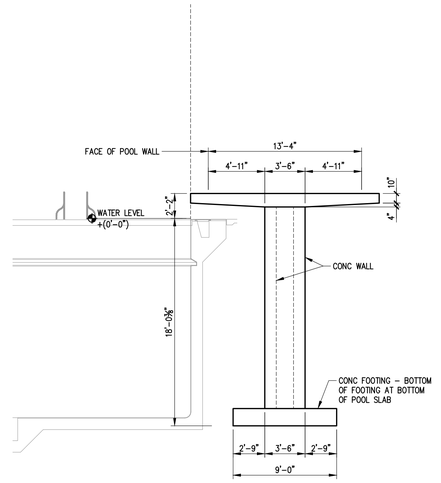
McCOMAS ENGINEERING
Structural Engineers



3M BOARD PLATFORM ELEVATION

SCALE: 3/16" = 1'-0"

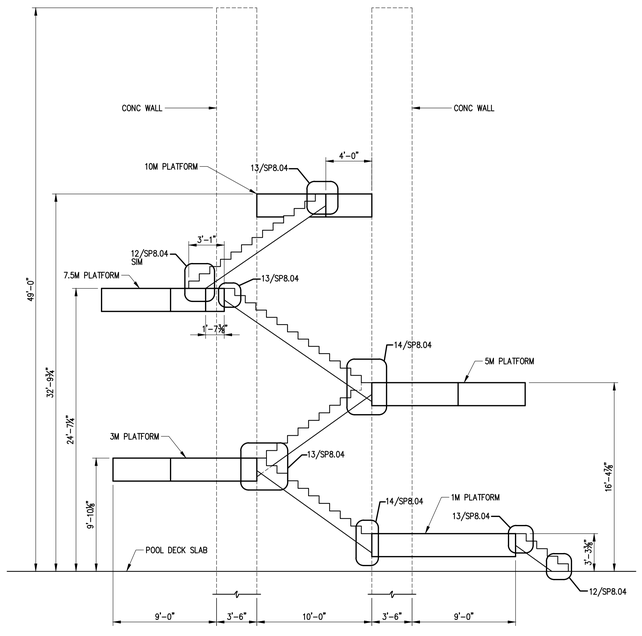
SOUTH ELEV 03 SP8.03



1M BOARD PLATFORM ELEVATION

SCALE: 3/16" = 1'-0"

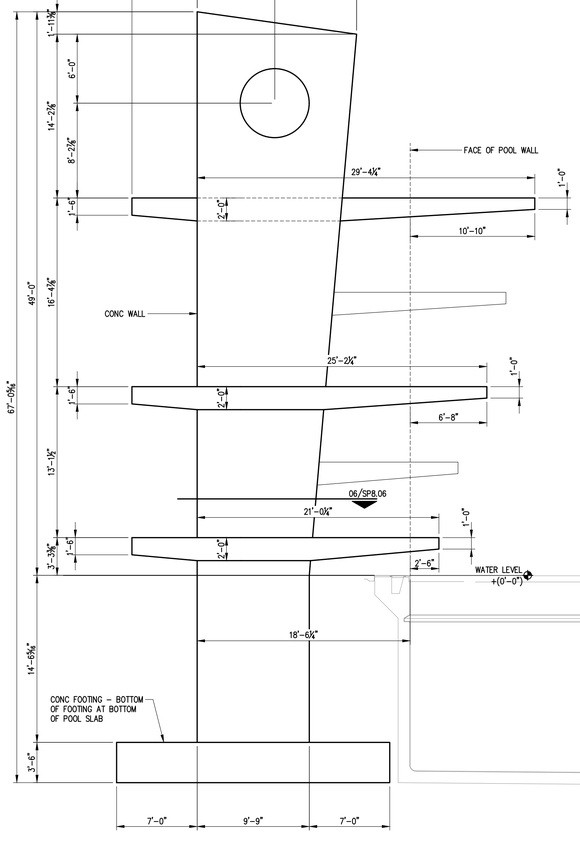
SOUTH ELEV 01 SP8.03



DIVE TOWER WEST ELEVATION

SCALE: 3/16" = 1'-0"

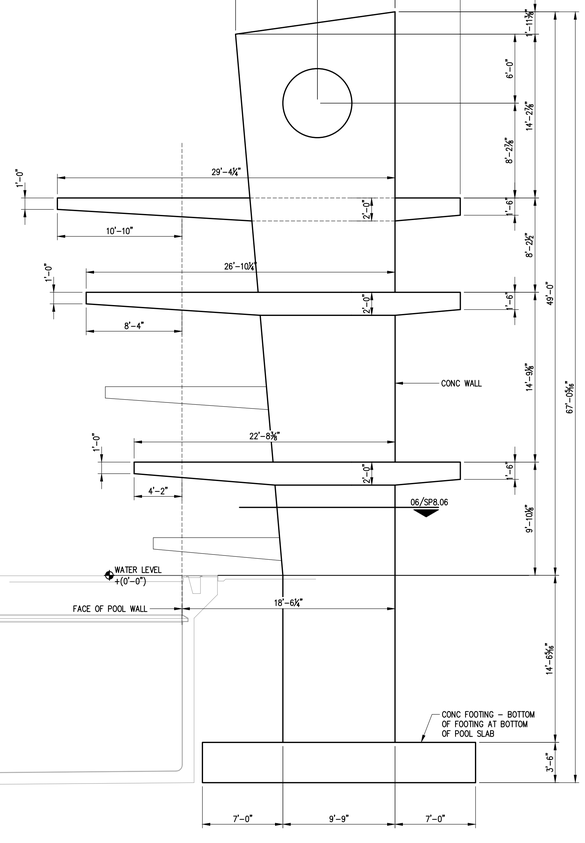
SOUTH ELEV 05 SP8.03



DIVE TOWER SOUTH ELEVATION

SCALE: 3/16" = 1'-0"

SOUTH ELEV 04 SP8.03



DIVE TOWER NORTH ELEVATION

SCALE: 3/16" = 1'-0"

NORTH ELEV 02 SP8.03

TWG
THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED
PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT	971805
DATE	06/07/2019
REVISED	

SP8.03

DIVE TOWER ELEVATIONS

ABBREVIATIONS LIST

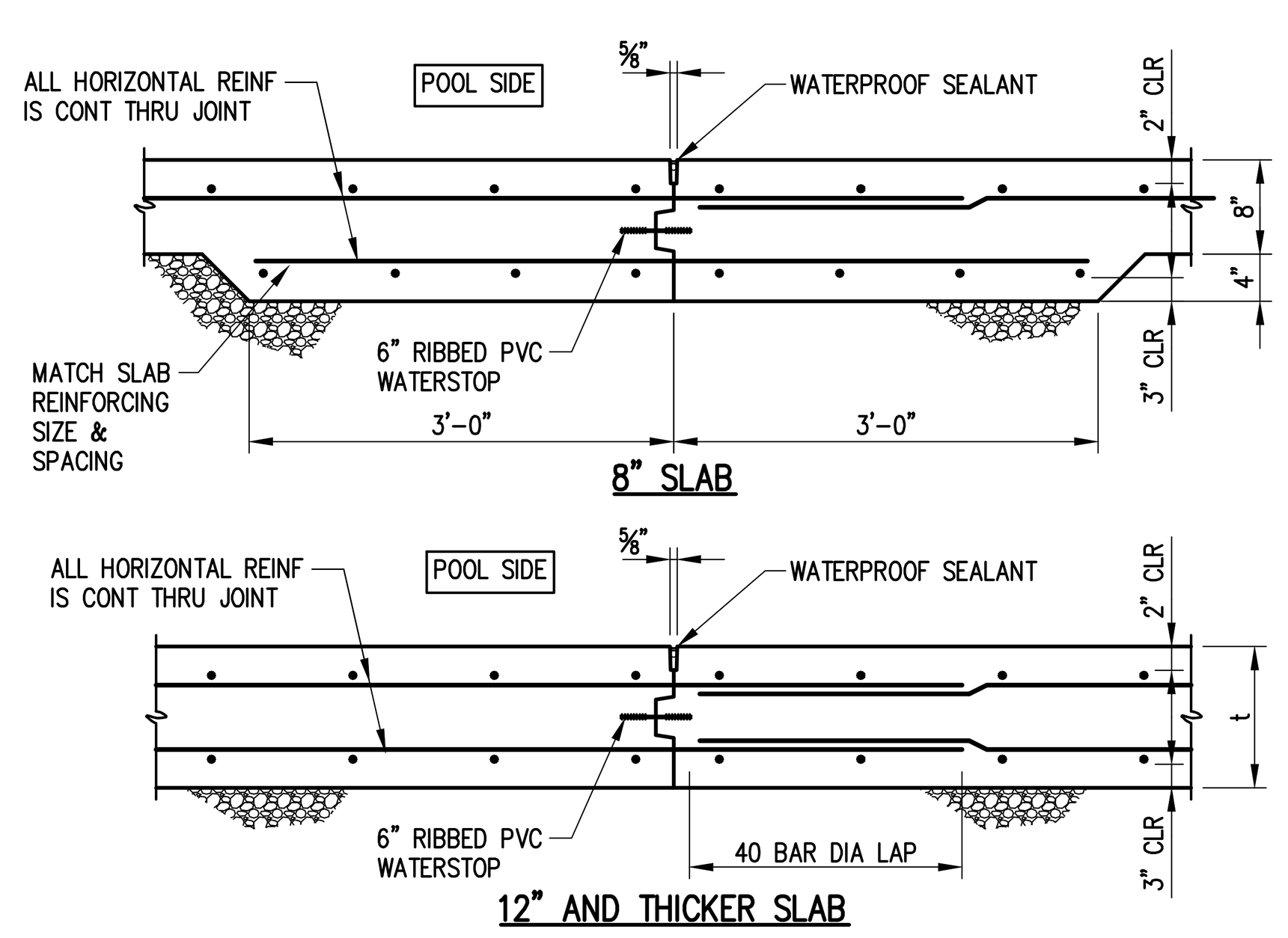
AR	ANCHOR RODS
ACI	AMERICAN CONCRETE INSTITUTE
ADD'L	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJACENT
AESS	ARCHITECTURALLY EXPOSED STRUCTURAL STEEL
AFF	ABOVE FINISHED FLOOR
AGGR	AGGREGATE
AHU	AIR HANDLING UNIT
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
ALUM	ALUMINUM
ALT	ALTERNATE
APA	AMERICAN PLYWOOD ASSOCIATION
APPROX	APPROXIMATE
ARCH	ARCHITECT
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS
AWS	AMERICAN WELDING SOCIETY
L	ANGLE
BB	BOND BEAM
B/B	BACK TO BACK
BC	BOTTOM CHORD
BD	BOARD
BLDG	BUILDING
BLK	BLOCK
BM	BEAM
BOTT	BOTTOM
BP	BEARING PLATE
BRDG	BRIDGING
BRG	BEARING
BRK	BRICK
BS	BOTH SIDES
BSMT	BASEMENT
BTWN	BETWEEN
BUC	BUILT UP COLUMN
c	CAMBER
C/C	CENTER TO CENTER
CANT	CANTILEVER
CFS	COLD FORMED STEEL
CJ	CONTROL AND OR CONSTRUCTION JOINT
CL	CENTERLINE
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
COORD	COORDINATE
COMP	COMPACTED
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
CTR	CENTER
CTRD	CENTERED
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DL	DEAD LOAD
DLT	DEEP LEG TRACK
DO	DITTO
DN	DOWN
DTL	DETAIL
DWG	DRAWING
DWL	DOWEL
EA	EACH
EE	EACH END
EF	EACH FACE
ENG	ENGINEER
ELEV	ELEVATION
ELECT	ELECTRICAL
EOD	EDGE OF DECK
EOS	EDGE OF SLAB
EQ	EQUAL
EQUIV	EQUIVALENT
ES	EACH SIDE
EW	EACH WAY
EX	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
F/	FACE OF
FD	FLOOR DRAIN
FDN	FOUNDATION
FIN	FINISH
FLR	FLOOR
FLG	FLANGE
FS	FAR SIDE
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GB	GRADE BEAM
GC	GENERAL CONTRACTOR
GL	GLULAM
GR	GRADE
HC	HOLLOW CORE
HD	HOLD DOWN
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HIGH POINT
HS	HEADED STUD
HSS	HOLLOW STRUCTURAL SECTION
ID	INSIDE DIAMETER
IF	INSIDE FACE
INFO	INFORMATION
INT	INTERIOR
INV	INVERT
JST	JOIST
JT	JOINT
K	KIP
KO	KNOCK OUT
LB	POUND
LDG	LEDGE
LG	LONG
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LNTL	LINTEL
LSL	LONG SLOTTED HOLES
LONG	LONGITUDINAL
LP	LOW POINT
LVL	LAMINATED VENEER LUMBER
MAS	MASONRY
MAT'L	MATERIAL
MAX	MAXIMUM
MBM	METAL BUILDING MFR
MCJ	MASONRY CONTROL JT
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MOM	MOMENT
MSW	MASONRY SHEAR WALL
MSL	MEAN SEA LEVEL
MTL	METAL
MW	MASONRY WALL
NIC	NOT IN CONTRACT
NO	NUMBER
NS	NEAR SIDE
NTS	NOT TO SCALE
O/O	OUT TO OUT
OA	OVERALL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OH	OVER HEAD
OPNG	OPENING
OPP	OPPOSITE
OPP HD	OPPOSITE HAND
OSB	ORIENTED STRAND BOARD
OSL	OUTSTANDING LEG
OVS	OVERSIZE HOLE
PAF	POWDER ACTUATED FASTENER
PC	PRECAST
PL	PLATE
PLF	POUNDS PER LINEAR FOOT
PLYWD	PLYWOOD
PNL	PANEL
PROJ	PROJECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSL	PARALLEL STRAND LUMBER
PT	PRESSURE TREATED
PTN	PARTITION
PVMT	PAVEMENT
QTY	QUANTITY
R	RADIUS
RD	ROOF DRAIN
REF	REFERENCE
REINF	REINFORCE(D)(ING)(MENT)
REQ'D	REQUIRED
REV	REVISION/REVISED
RO	ROUGH OPENING
RRD	ROOF RELIEF DRAIN
RTN	RETURN
RTU	ROOF TOP UNIT
RW	RETAINING WALL
SCHED	SCHEDULE
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SJ	SAWCUT JOINT
SJI	STEEL JOIST INSTITUTE
SL	SLOPED
SLRS	SEISMIC LOAD RESISTING SYSTEM
SPA	SPACE(S)
SPECS	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL
SSL	SHORT SLOTTED HOLES
STD	STANDARD
STIFF	STIFFENERS
STL	STEEL
STRUCT	STRUCTURAL
SW	SHEAR WALL
SYMM	SYMMETRICAL
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TB	TIE BEAM
TC	TOP CHORD
TEMP	TEMPERATURE
TF	TRENCH FOOTING
THK	THICK
THKS	THICKENED SLAB
THR'D	THREADED
TL	TOTAL LOAD
TOP'G	TOPPING
TRANS	TRANSVERSE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
VIF	VERIFY IN FIELD
w/	WITH
WD	WOOD
WO	WINDOW OPENING
WP	WORKING POINT
WT	WEIGHT
WWF	WELDED WIRE FABRIC

ELEVATION TOP AND BOTTOM OF LIST

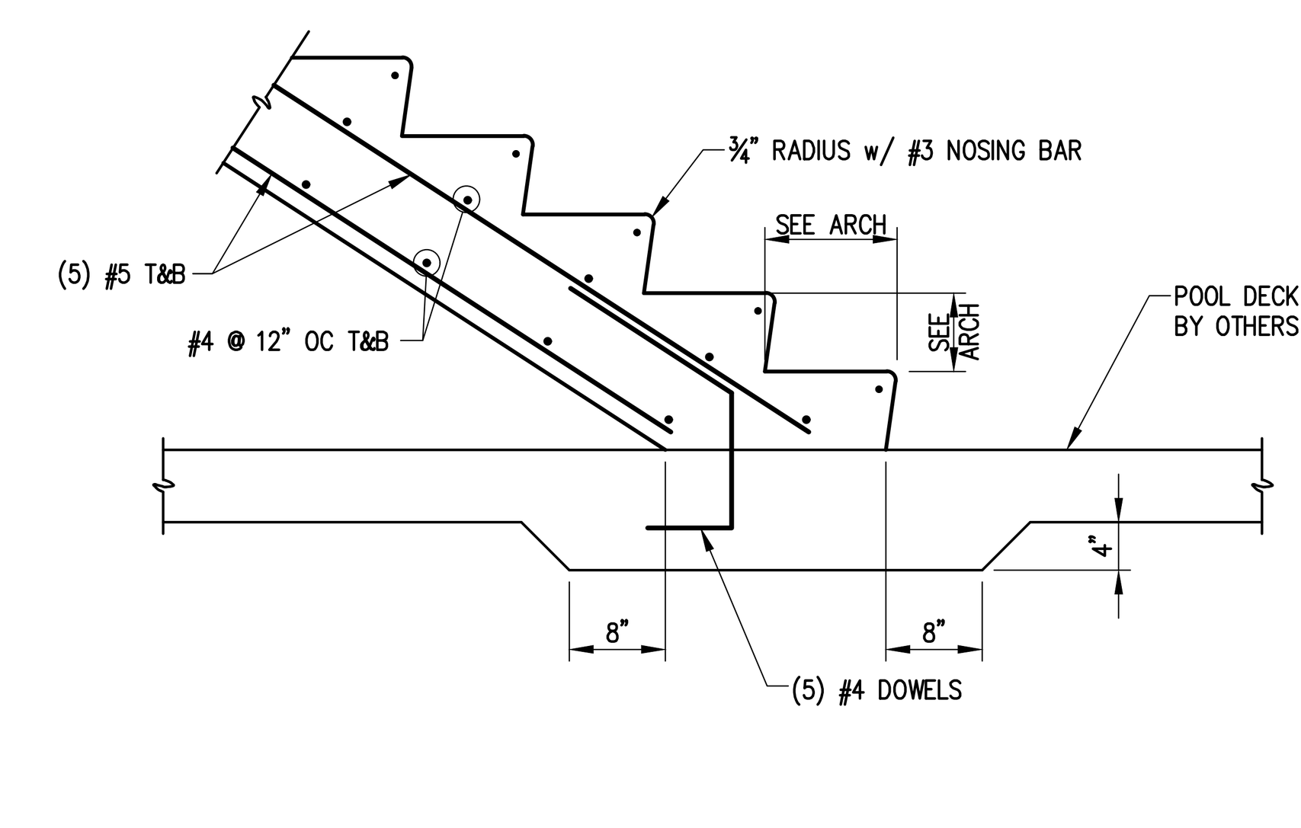
T/	ELEVATION, TOP OF
B/	ELEVATION, BOTTOM OF
T/BB	TOP OF BOND BEAM
T/BM	TOP OF BEAM
T/CONC	TOP OF CONCRETE
T/F	TOP OF FOOTING
T/LDG	TOP OF LEDGE
T/MAS	TOP OF MASONRY
T/P	TOP OF PIER
T/SLAB	TOP OF SLAB
T/STL	TOP OF STEEL
T/W	TOP OF WALL
T/GB	TOP OF GRADE BEAM
T/CAIS	TOP OF CAISSON
B/PL	BOTTOM OF PLATE
B/F	BOTTOM OF FOOTING

SYMBOLS

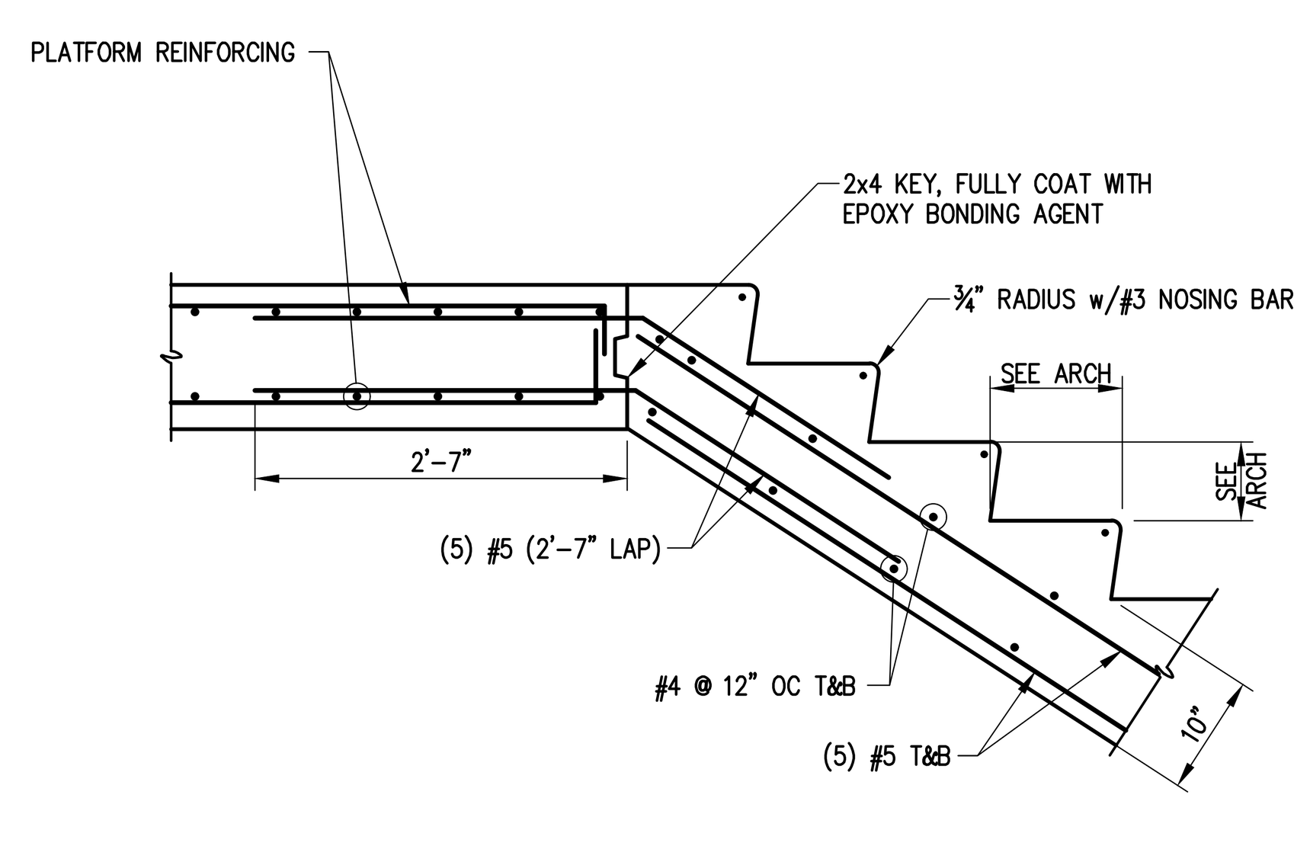
ø	DIAMETER
°	DEGREE
⌖	ELEVATION
±	PLUS OR MINUS



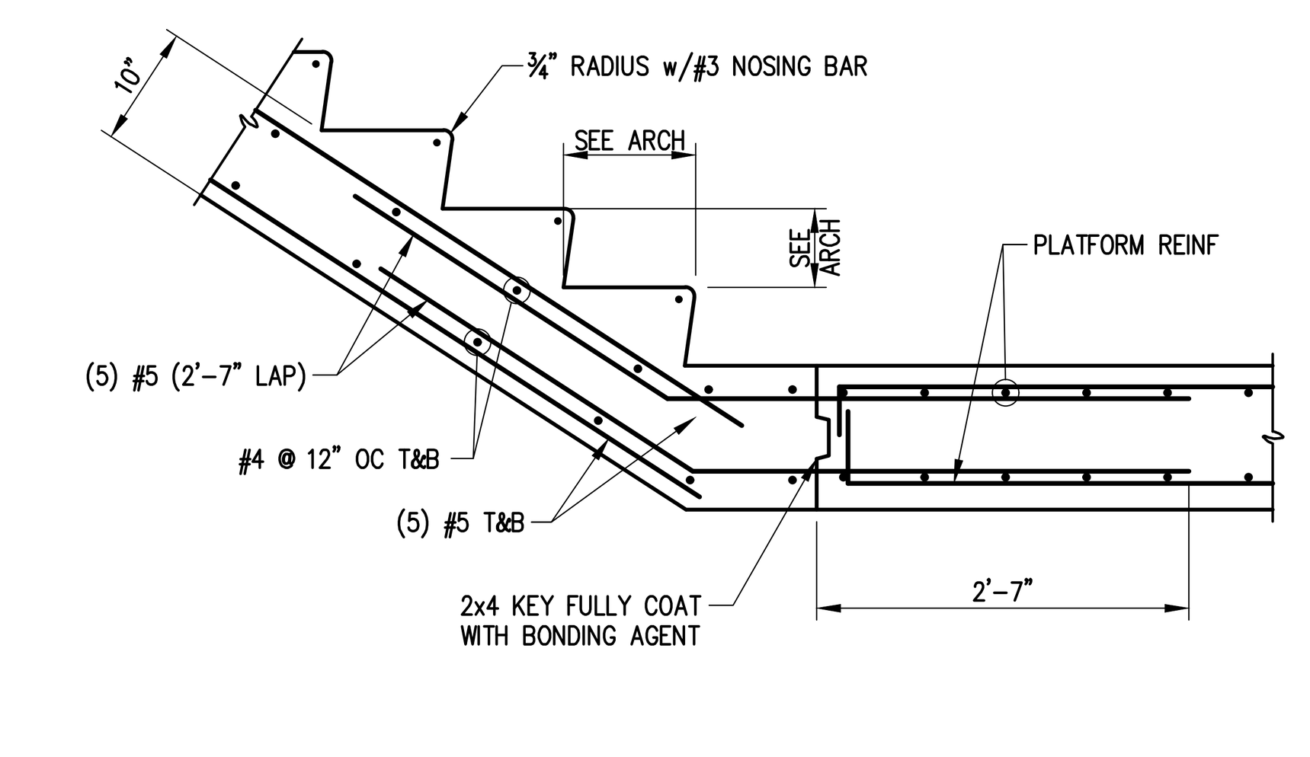
TYP POOL SLAB CONSTRUCTION JOINT (11 / SP8.04)
SCALE: NTS POOL-017



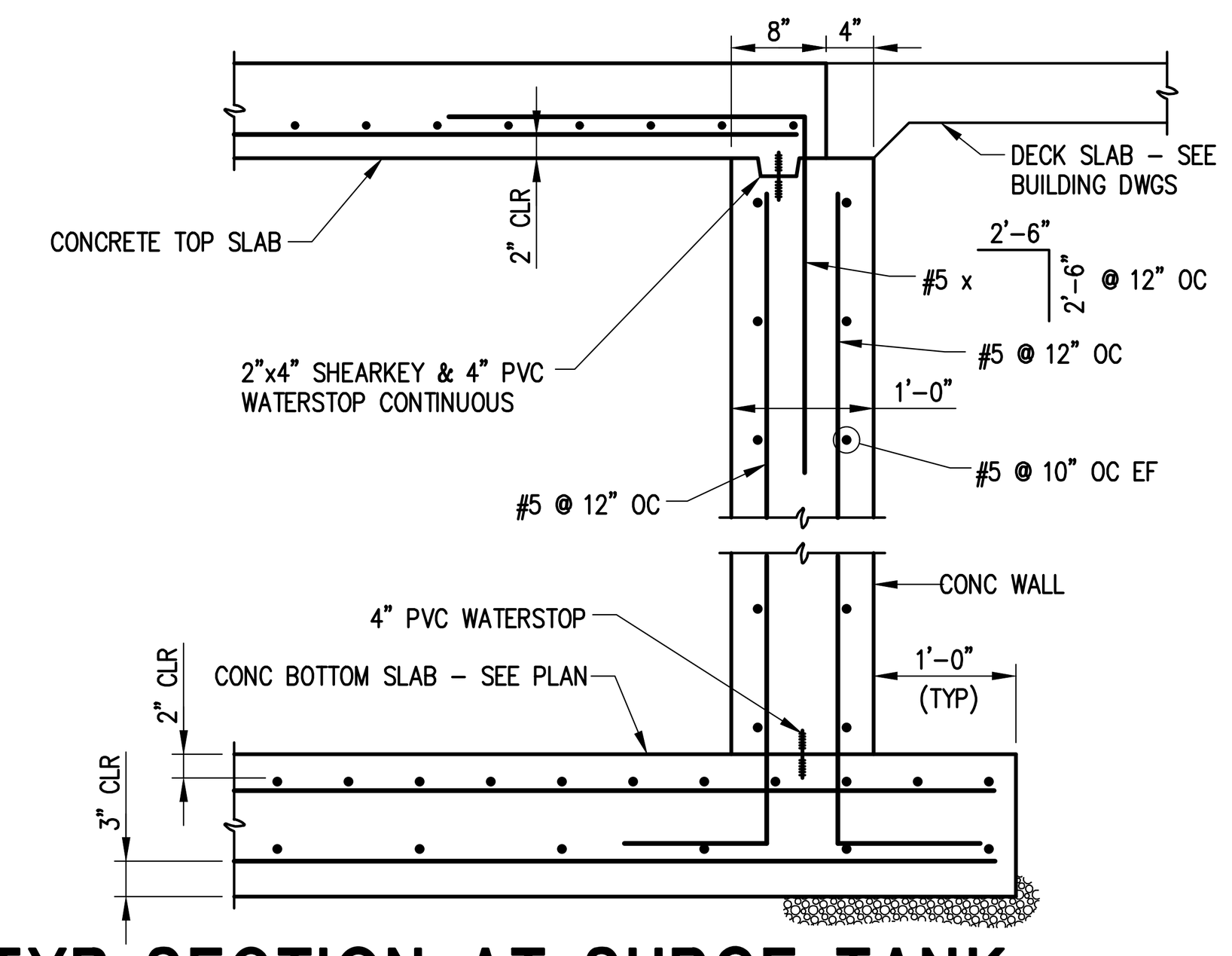
TYPICAL STAIR SECTION (12 / SP8.04)
SCALE: ¾" = 1'-0" POOL-023



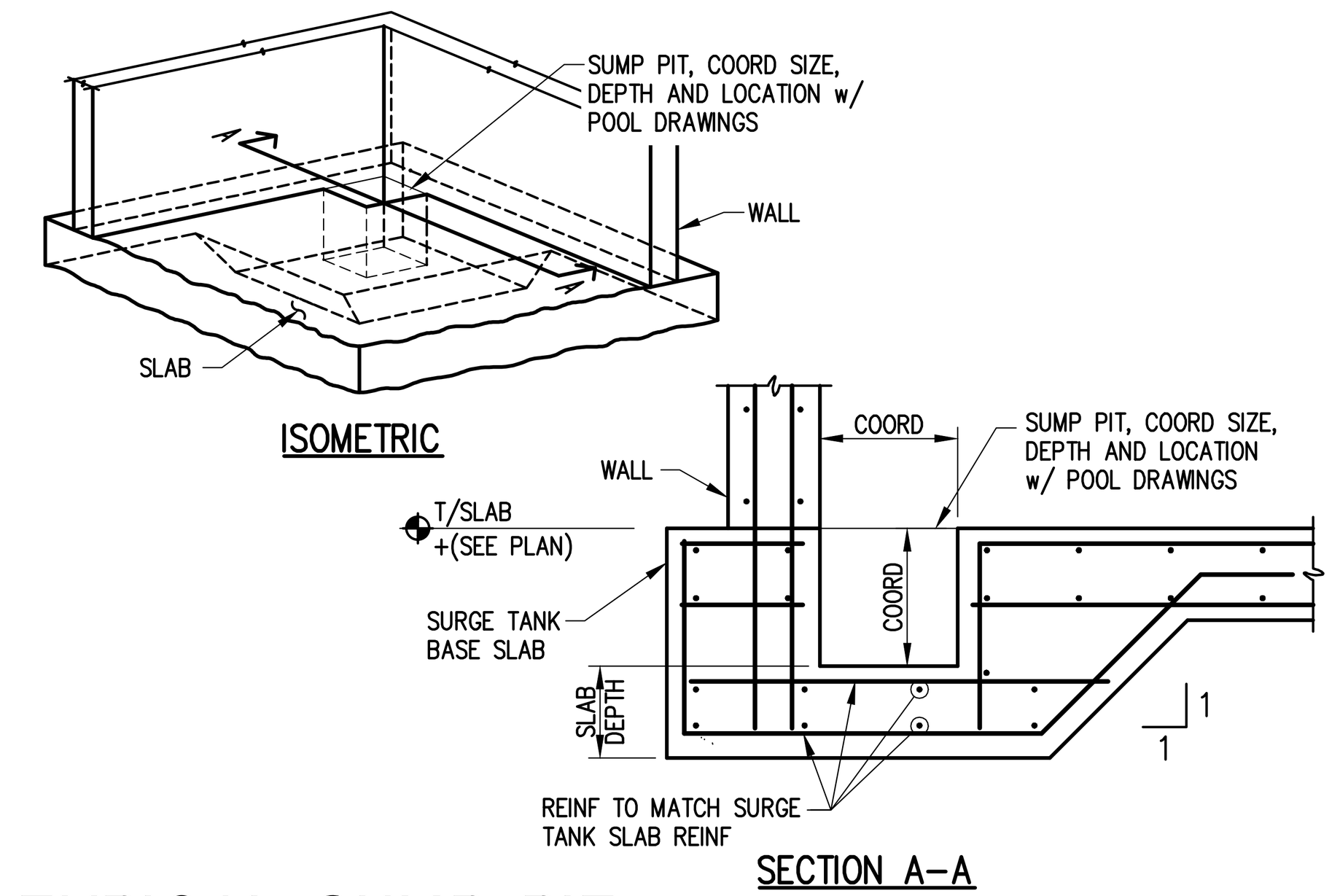
PLATFORM STAIR SECTION (13 / SP8.04)
SCALE: ¾" = 1'-0" POOL-024



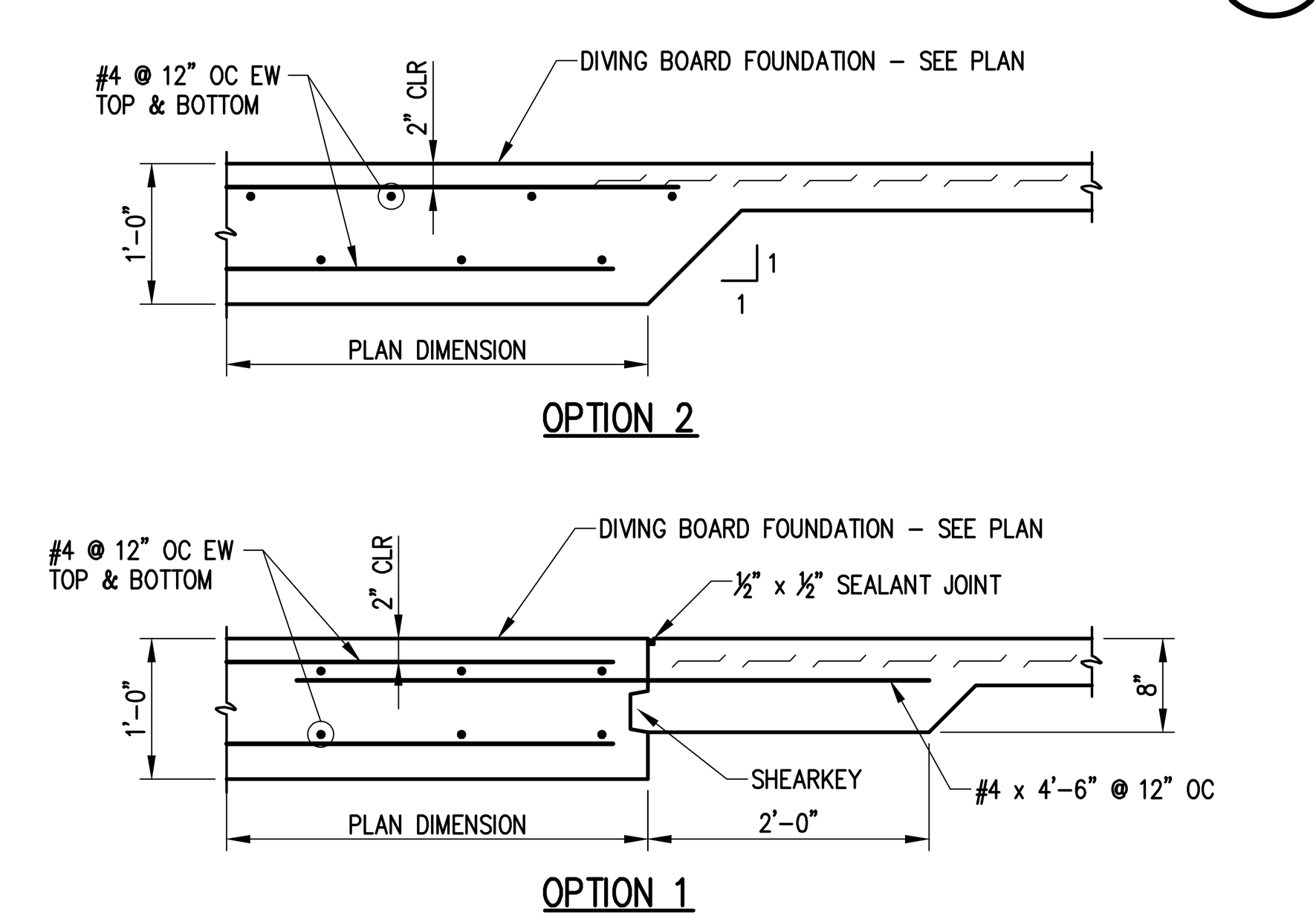
PLATFORM STAIR SECTION (14 / SP8.04)
SCALE: ¾" = 1'-0" POOL-024A



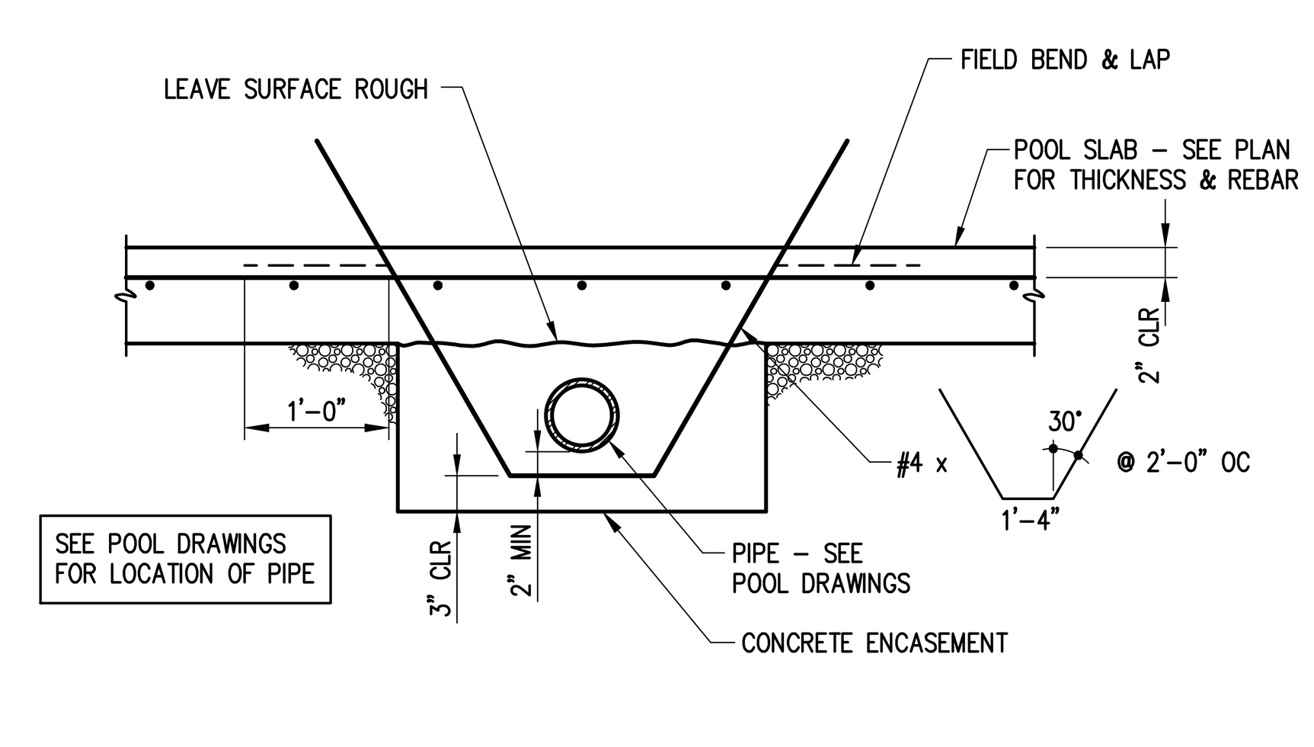
TYP SECTION AT SURGE TANK (06 / SP8.04)
SCALE: ¾" = 1'-0" POOL-011



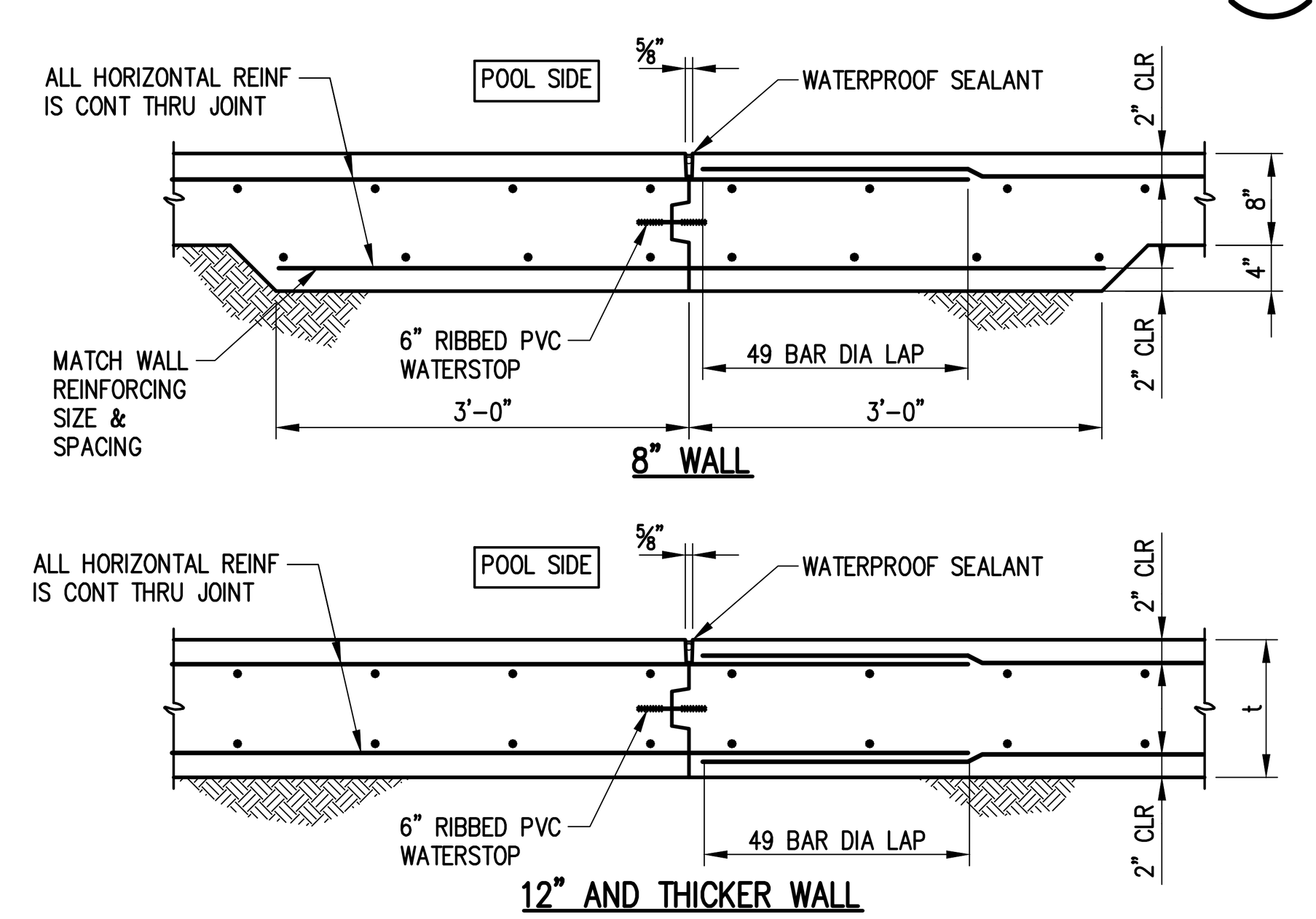
TYPICAL SUMP PIT (07 / SP8.04)
SCALE: NTS POOL-012



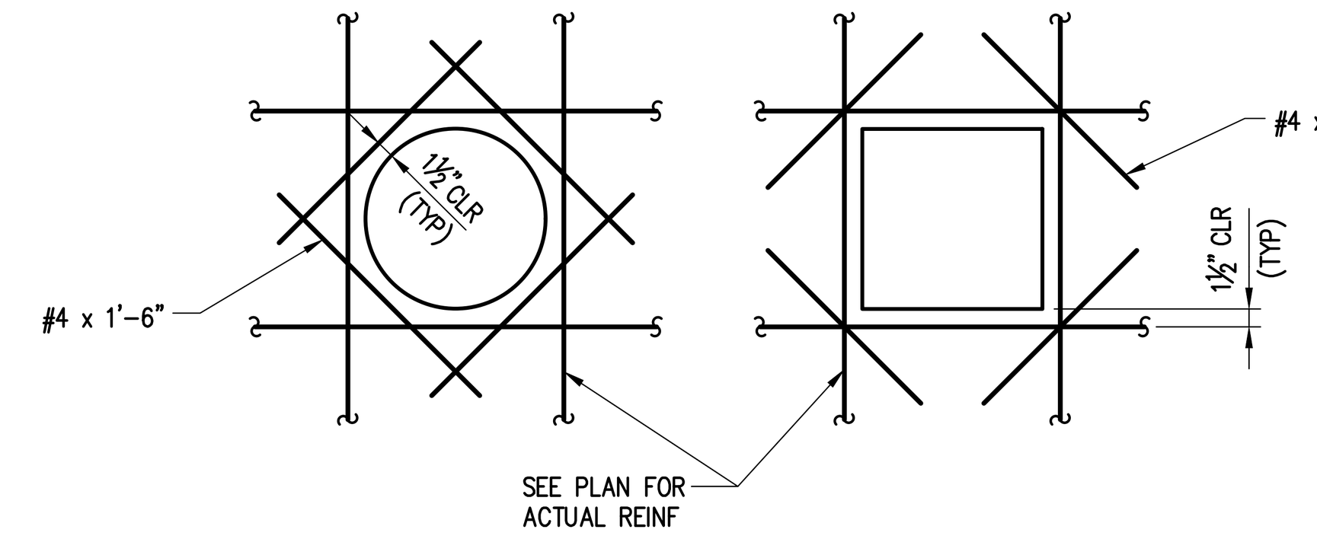
SECTION (08 / SP8.04)
SCALE: ¾" = 1'-0" POOL-013



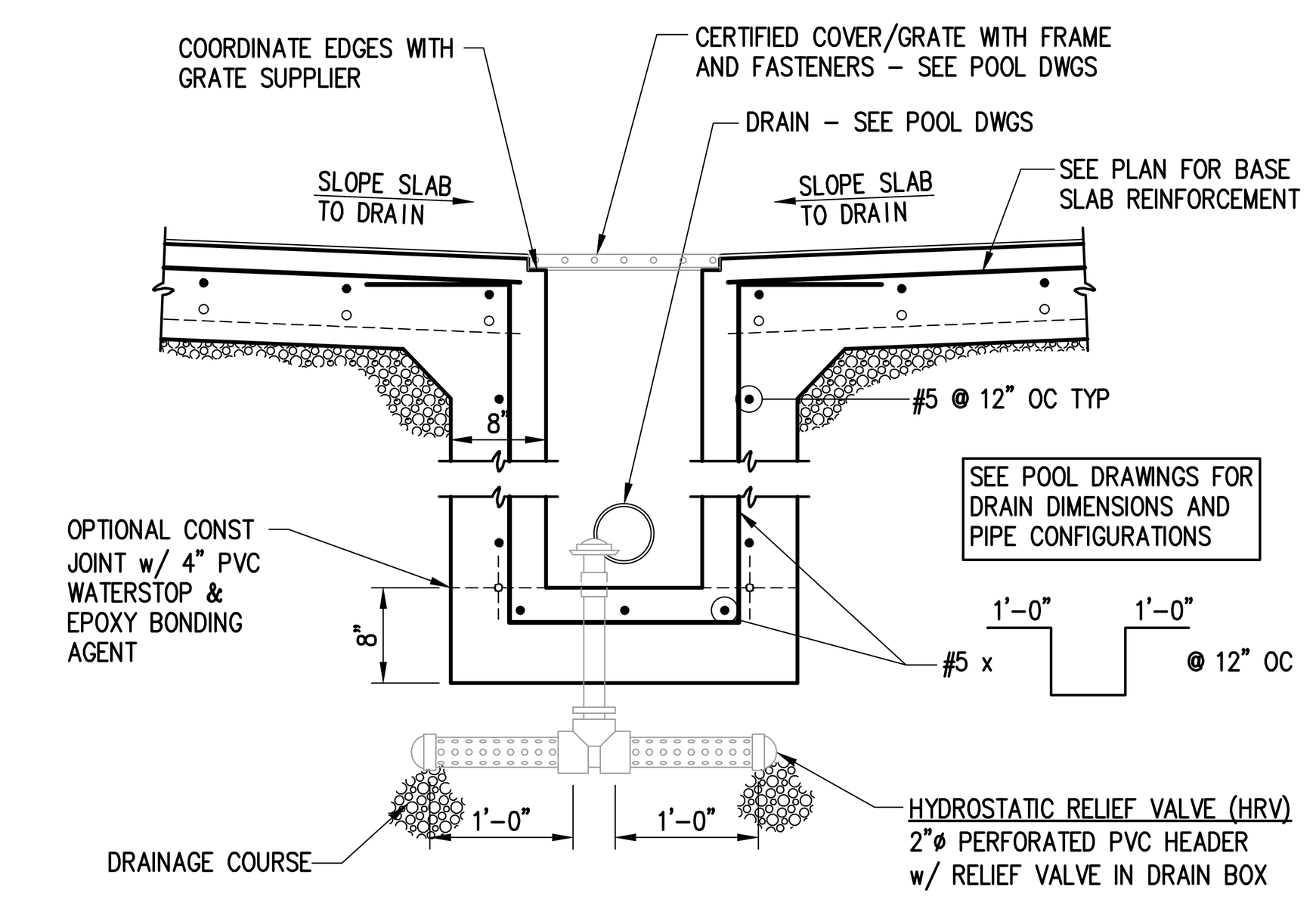
TYP PIPE ENCASEMENT DETAIL (09 / SP8.04)
SCALE: NTS POOL-015



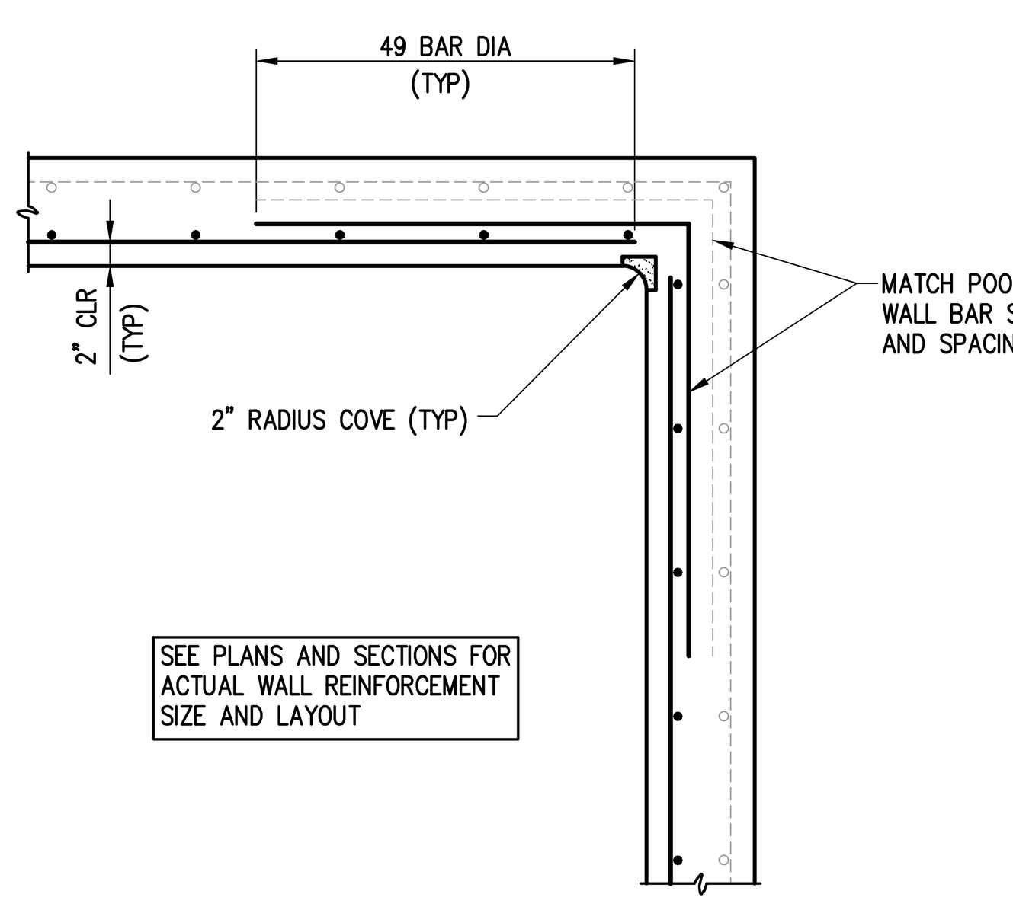
TYP CONCRETE WALL CONSTRUCTION JOINT (10 / SP8.04)
SCALE: ¾" = 1'-0" POOL-016



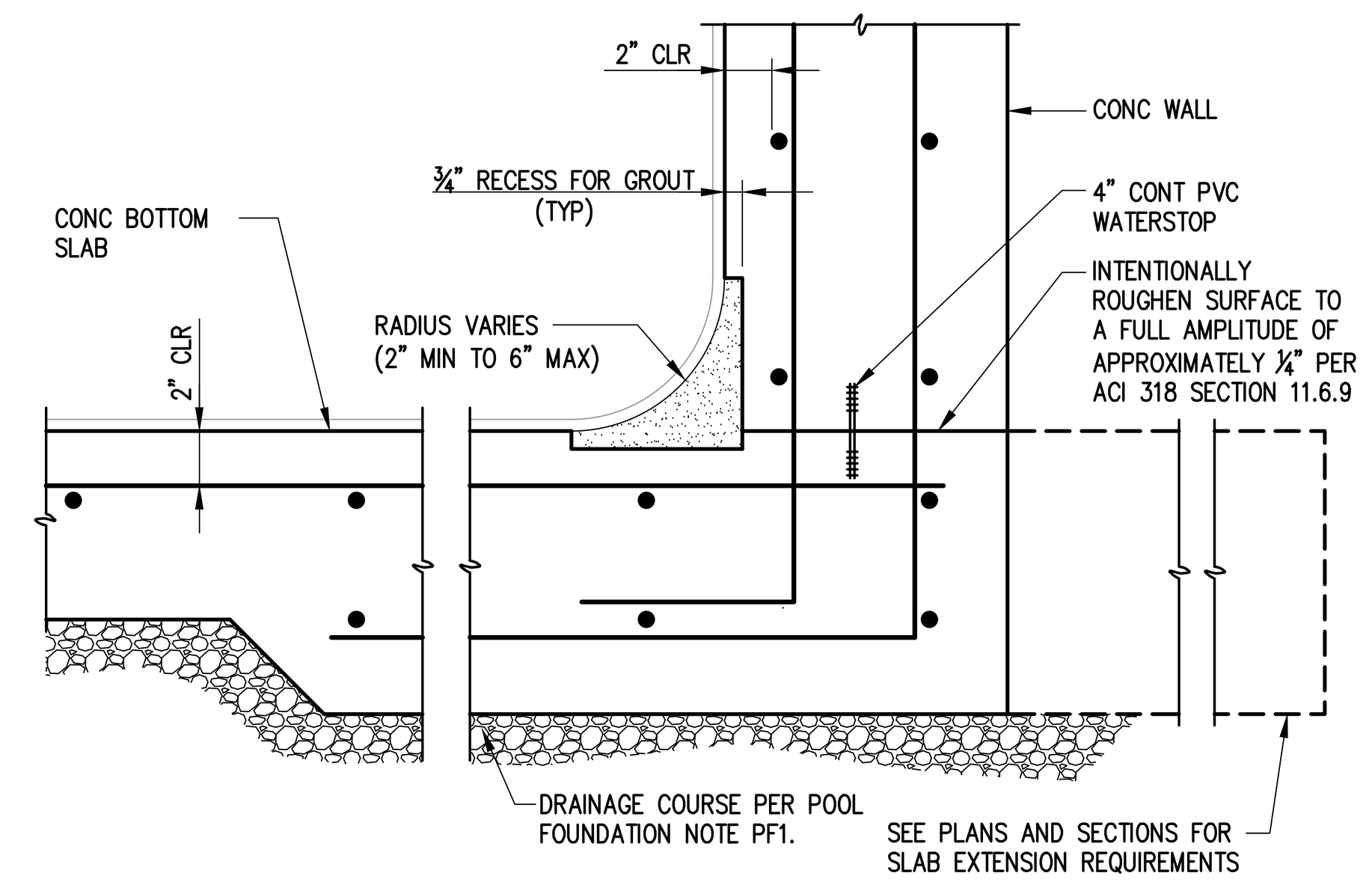
TYP REINFORCING AT EMBEDDED ITEMS (01 / SP8.04)
SCALE: NTS POOL-001



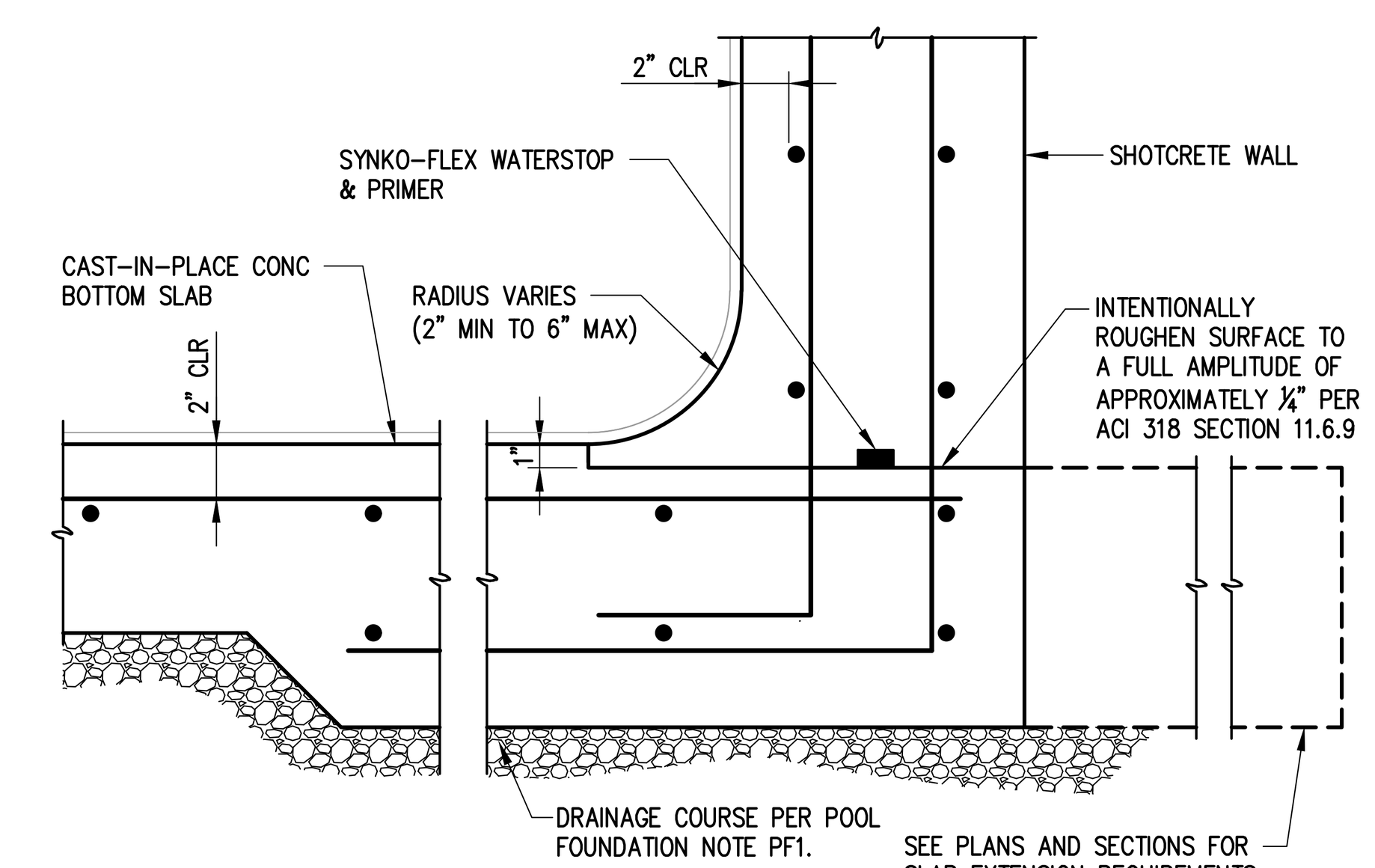
TYPICAL DRAIN BOX DETAIL (02 / SP8.04)
SCALE: ¾" = 1'-0" POOL-002



TYPICAL POOL WALL CORNER DETAIL (03 / SP8.04)
SCALE: ¾" = 1'-0" POOL-003



TYP CAST-IN-PLACE WALL BASE (04 / SP8.04)
SCALE: 1½" = 1'-0" POOL-004



TYP SHOTCRETE WALL BASE (05 / SP8.04)
SCALE: 1½" = 1'-0" POOL-006

1717 East 116th Street, Suite 200
Carmel, Indiana 46032
317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404
McCOMAS ENGINEERING
Structural Engineers

SWIMMING POOL STRUCTURE NOTES

PG1. [illegible] International Building Code 2012 / ACI 318-11 / ACI 350-06

PG2. [illegible]

PG3. [illegible] ACI 350 [illegible]

PG4. [illegible] 6'-0" [illegible] 2'-0" [illegible] 2'-0" [illegible]

PG5. [illegible]

HYRDOSTATIC RELIEF VALVES

HV1. HRV [illegible]

HV2. [illegible]

POOL SHELL AND RELATED ELEMENTS REINFORCED CONCRETE AND SHOTCRETE NOTES

PC1. [illegible]

PC2. [illegible] 4000 [illegible] 28 [illegible] 0.42.

PC3. [illegible] ACI 318-05, ACI 315-05, [illegible] CRSI MSP-1-01.

PC4. [illegible] ASTM A615, Grade 60.

PC5. [illegible]

PC6. [illegible] 2" [illegible] / 2" [illegible] / 3" [illegible]

PC7. [illegible] 10 [illegible]

PC8. [illegible]

PC9. [illegible]

CONSTRUCTION LOAD NOTES

CL1. [illegible]

WATER-TIGHTNESS TESTING

WT1. [illegible]

POOL FOUNDATION STRUCTURE

PF1. [illegible] ASTM D 448 [illegible] 57 [illegible] 100 [illegible] 1 1/2 [illegible] No. 8 [illegible] 95 [illegible] (ASTM D1557), [illegible] 6" [illegible] 8" [illegible] 140N [illegible]

[illegible] 12" [illegible] 0'-0" [illegible] 3'-0"
12" [illegible] 3'-0"
12" [illegible]

PF2. [illegible] ASTM D 448 [illegible] 57 [illegible] 100 [illegible] 1 1/2 [illegible] No. 8 [illegible] 95 [illegible] (ASTM D1557), [illegible] 6" [illegible] 8" [illegible] 140N [illegible]

PF3. [illegible]

[illegible]	[illegible] 03/06/2019.
[illegible]	[illegible]
[illegible]	135 [illegible]
[illegible]	45 [illegible]
[illegible]	345 [illegible]
[illegible]	None
[illegible]	1/2"
[illegible]	1"
[illegible]	2500 [illegible]
	4000 [illegible]

BAR DEVELOPMENT & SPLICE LENGTHS

BAR	TENSION DEVELOPMENT		SPLICES	
	TOP BAR *	OTHER	TOP BAR *	OTHER
#3	19"	15"	25"	19"
#4	25"	19"	33"	25"
#5	31"	24"	41"	31"
#6	37"	29"	49"	37"
#7	54"	42"	71"	54"
#8	62"	48"	81"	62"
#9	70"	54"	91"	70"
#10	79"	61"	102"	79"
#11	87"	67"	114"	87"

* USE TOP BAR LENGTHS WHEN BARS ARE PLACED SUCH THAT THERE IS MORE THAN 1'-0" OF CONCRETE BELOW BAR

CONCRETE BEAM SCHEDULE

MARK	SIZE (W x D)	REINFORCEMENT	COMMENTS
B1	18" x 18"	(3) #6 T&B #3 TIES @ 9" OC	HOOKED ENDS TOP BARS ONLY
B2	36" x 24"	(8) #7 T&B, #3 TIES @ 6" OC	HOOKED ENDS TOP BARS ONLY
B3	36" x 24"	(8) #8 T&B, #3 TIES @ 6" OC	HOOKED ENDS TOP BARS ONLY
B4	48" x 24"	(10 #8 T&B, #3 TIES @ 6" OC	HOOKED ENDS TOP BARS ONLY

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST. SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED

CONSTRUCTION DOCUMENTS

PROPOSED

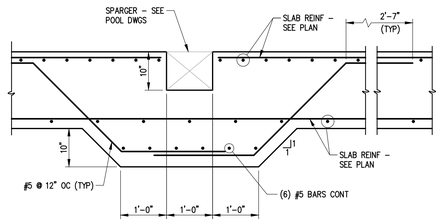
CITY OF PHARR AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT	971805
DATE	06/07/2019
REVISED	

SP8.04

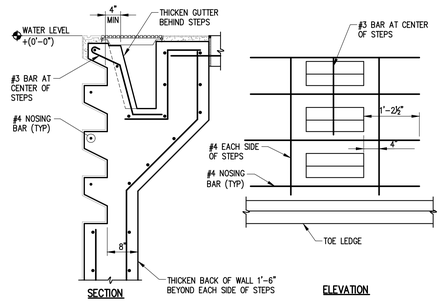
POOL STRUCTURAL DETAILS



SECTION

SCALE: ¾" = 1'-0"

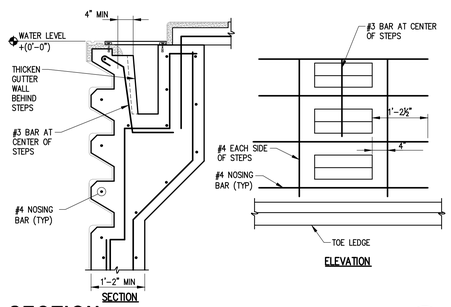
DET00J_19066 — 09 SP8.05



SECTION

SCALE: ¾" = 1'-0"

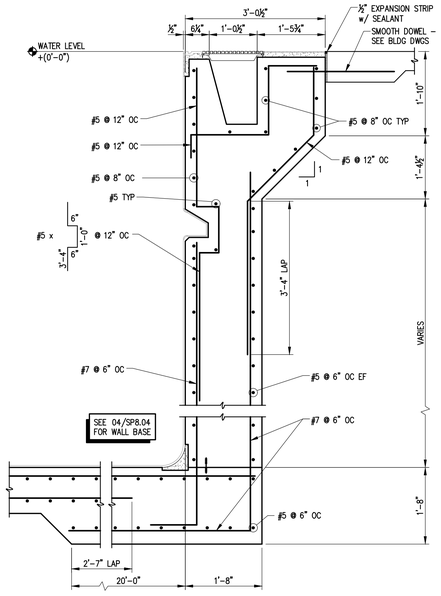
DET007_19066 — 06 SP8.05



SECTION

SCALE: ¾" = 1'-0"

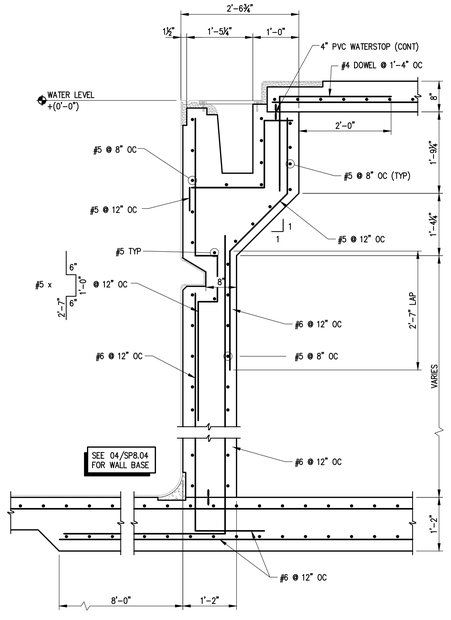
DET008_19066 — 03 SP8.05



SECTION

SCALE: ¾" = 1'-0"

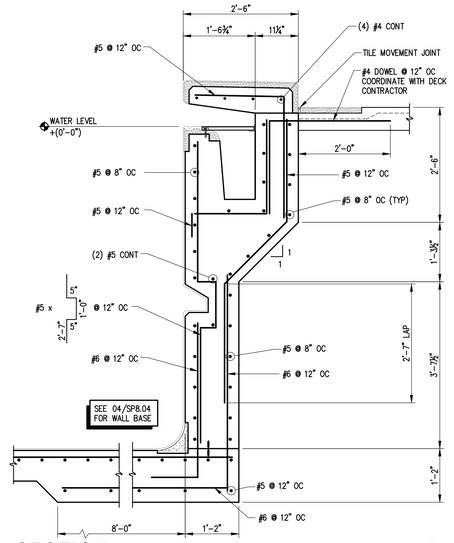
DET009_19066 — 07 SP8.05



SECTION

SCALE: ¾" = 1'-0"

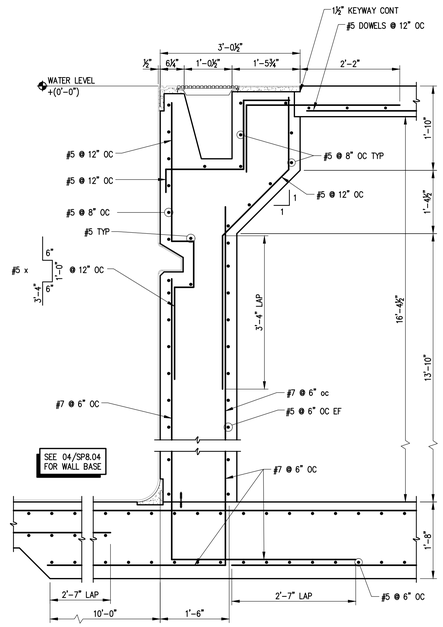
DET005_19066 — 04 SP8.05



SECTION

SCALE: ¾" = 1'-0"

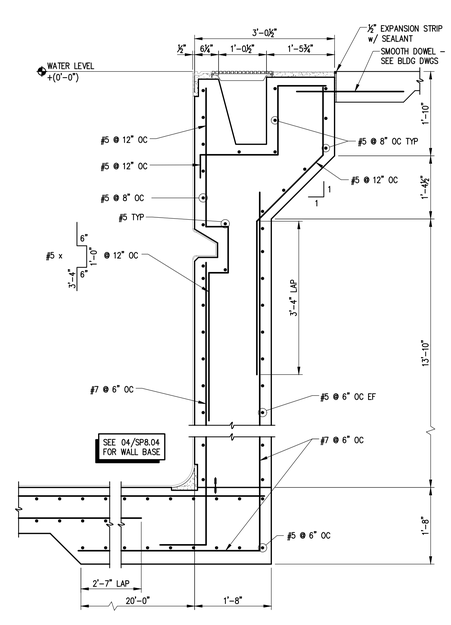
DET001_19066 — 01 SP8.05



SECTION

SCALE: ¾" = 1'-0"

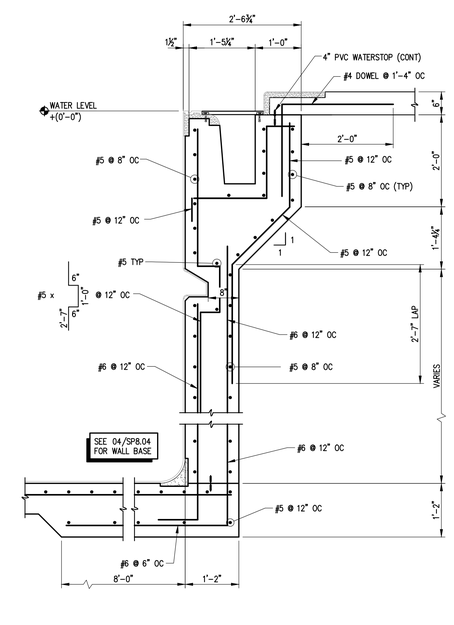
DET006_19066 — 08 SP8.05



SECTION

SCALE: ¾" = 1'-0"

DET004_19066 — 05 SP8.05



SECTION

SCALE: ¾" = 1'-0"

DET003_19066 — 02 SP8.05

1717 East 116th Street, Suite 200
Carmel, Indiana 46032
317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

McCOMAS ENGINEERING
Structural Engineers

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

STATE OF TEXAS
CHARLES RODNEY McCOMAS
100772
LICENSED
PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

PROJECT 971805
DATE 06/07/2019
REVISED

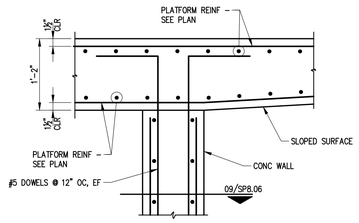
SP8.05

POOL STRUCTURAL SECTIONS

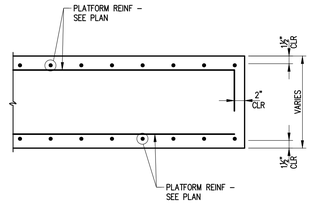
1717 East 116th Street, Suite 200
Carmel, Indiana 46032

317-580-0402
www.mccomaseng.com
Project No: MEI 19066
Firm No: F-11404

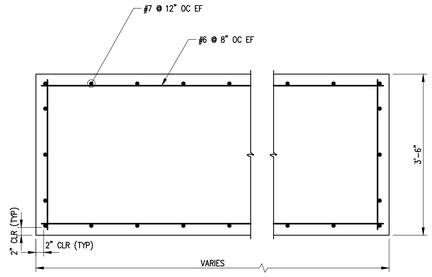
McCOMAS ENGINEERING
Structural Engineers



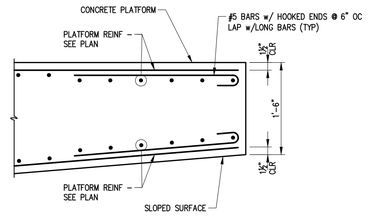
SECTION
SCALE: 1" = 1'-0"
DET00H_19066 — 10 / SP8.06



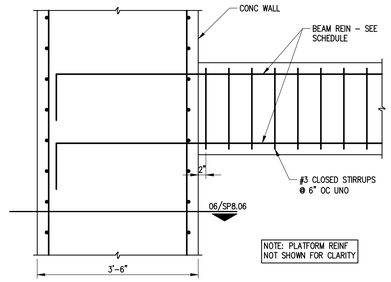
SECTION
SCALE: 1" = 1'-0"
DET00E_19066 — 05 / SP8.06



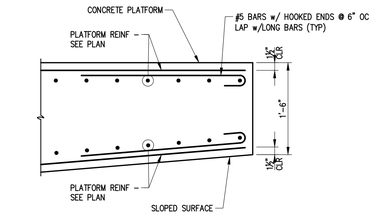
SECTION
SCALE: ¾" = 1'-0"
DET010_19066 — 06 / SP8.06



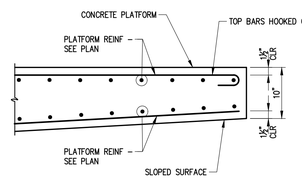
SECTION
SCALE: 1" = 1'-0"
DET00A_19066 — 01 / SP8.06



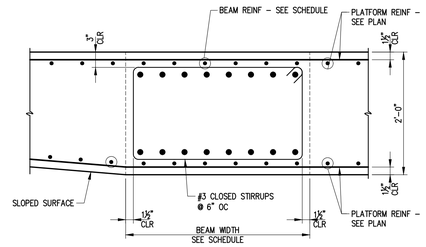
TYP CONC BEAM-WALL CONN
SCALE: ¾" = 1'-0"
DET011_19066 — 07 / SP8.06



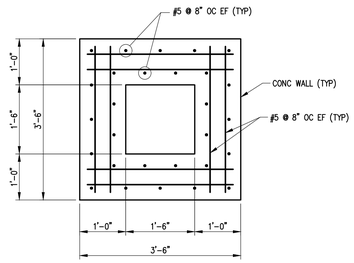
SECTION
SCALE: 1" = 1'-0"
DET00B_19066 — 02 / SP8.06



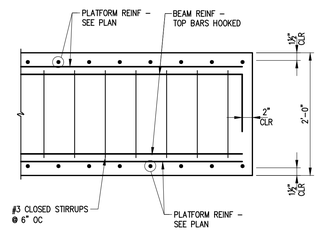
SECTION
SCALE: 1" = 1'-0"
DET00F_19066 — 08 / SP8.06



SECTION
SCALE: 1" = 1'-0"
DET00C_19066 — 03 / SP8.06



SECTION
SCALE: ¾" = 1'-0"
DET00G_19066 — 09 / SP8.06



SECTION
SCALE: 1" = 1'-0"
DET00D_19066 — 04 / SP8.06

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

CONSTRUCTION DOCUMENTS

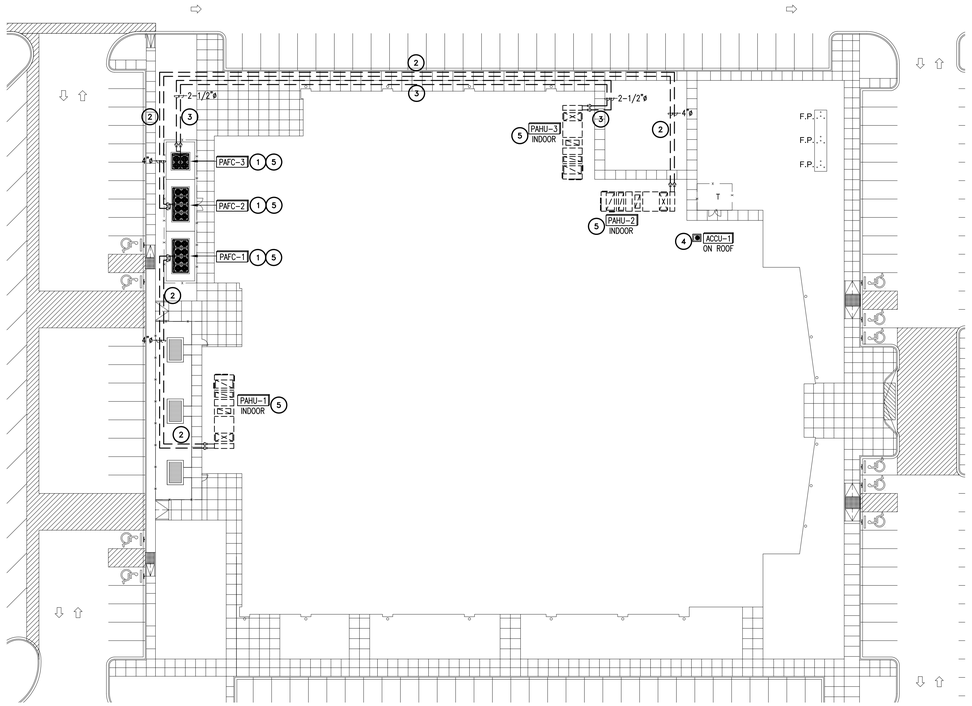
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS

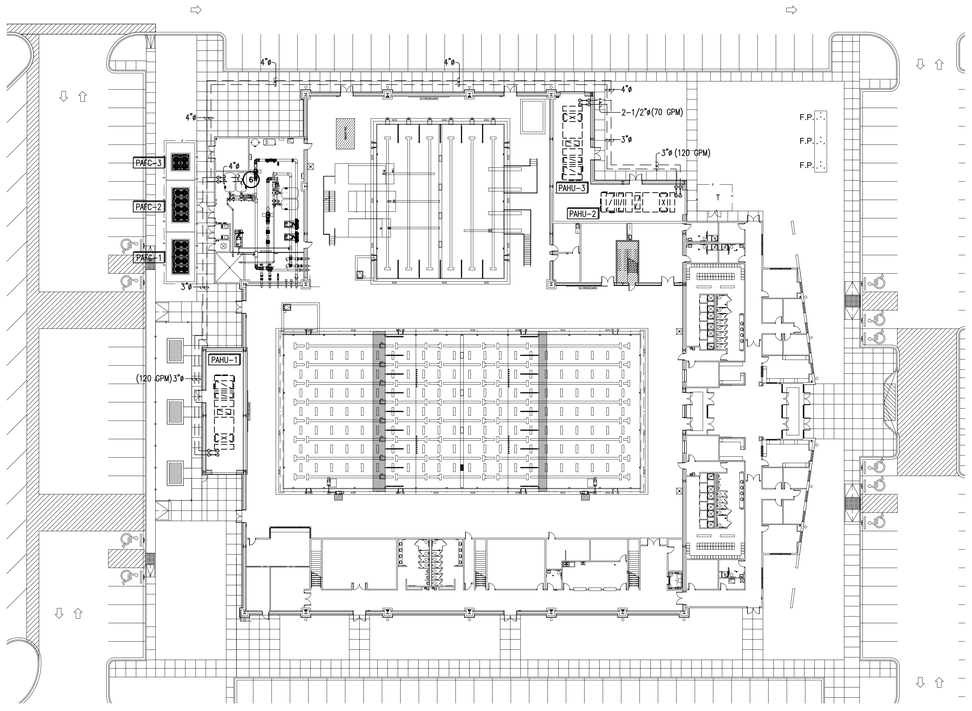
PROJECT 971805
DATE 06/07/2019
REVISED

SP8.06
POOL STRUCTURAL SECTIONS



A MECHANICAL FLUID COOLER PIPING PLAN

SCALE: 1" = 30'-0"



B MECHANICAL POOL HEATING PIPING PLAN

SCALE: 1" = 30'-0"

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPTANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) FLUID COOLER PIPING LOCATED IN MECHANICAL ROOM/ POOL EQUIPMENT ROOM, SHALL BE LABELED (DIRECTION OF FLOW, AND SERVICE).

KEYED NOTES:○

1. FLUID COOLER SHALL BE MOUNTED ON 6" HIGH CONCRETE PAD. PAD SHALL EXTEND 6" BEYOND UNIT PERIMETER.
2. PROVIDE AND INSTALL 4"ø CPVC SCHEDULE 80 INTER CONNECTION PIPING BETWEEN FLUID COOLER AND ASSOCIATED AIR HANDLING UNIT. EXTERIOR LINES SHALL BE MINIMUM 3-FEET BELOW GRADE. COORDINATE EXISTING/PROPOSED UTILITY LOCATIONS TO AVOID CONFLICTS. PROVIDE NECESSARY TRANSITIONS/OFFSETS AS REQUIRED.
3. PROVIDE AND INSTALL 2-1/2"ø CPVC SCHEDULE 80 INTER CONNECTION PIPING BETWEEN FLUID COOLER AND ASSOCIATED AIR HANDLING UNIT. EXTERIOR LINES SHALL BE MINIMUM 3-FEET BELOW GRADE. COORDINATE EXISTING/PROPOSED UTILITY LOCATIONS TO AVOID CONFLICTS. PROVIDE NECESSARY TRANSITIONS/OFFSETS AS REQUIRED.
4. ROOF MOUNTED CONDENSER, PROVIDE WITH ROOF CURB. SYSTEM SHALL BE INCLUDED AS AN ALTERNATE.
5. PROVIDE ISOLATION VALVES AND UNION PRIOR TO CONNECTION OF MECHANICAL EQUIPMENT.
6. ROUTE POOL HEATING PIPING OVER HEAD AND CONNECT TO POOL TEE FITTING FURNISHED BY POOL CONSULTANT. REFER TO POOL DRAWINGS.

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

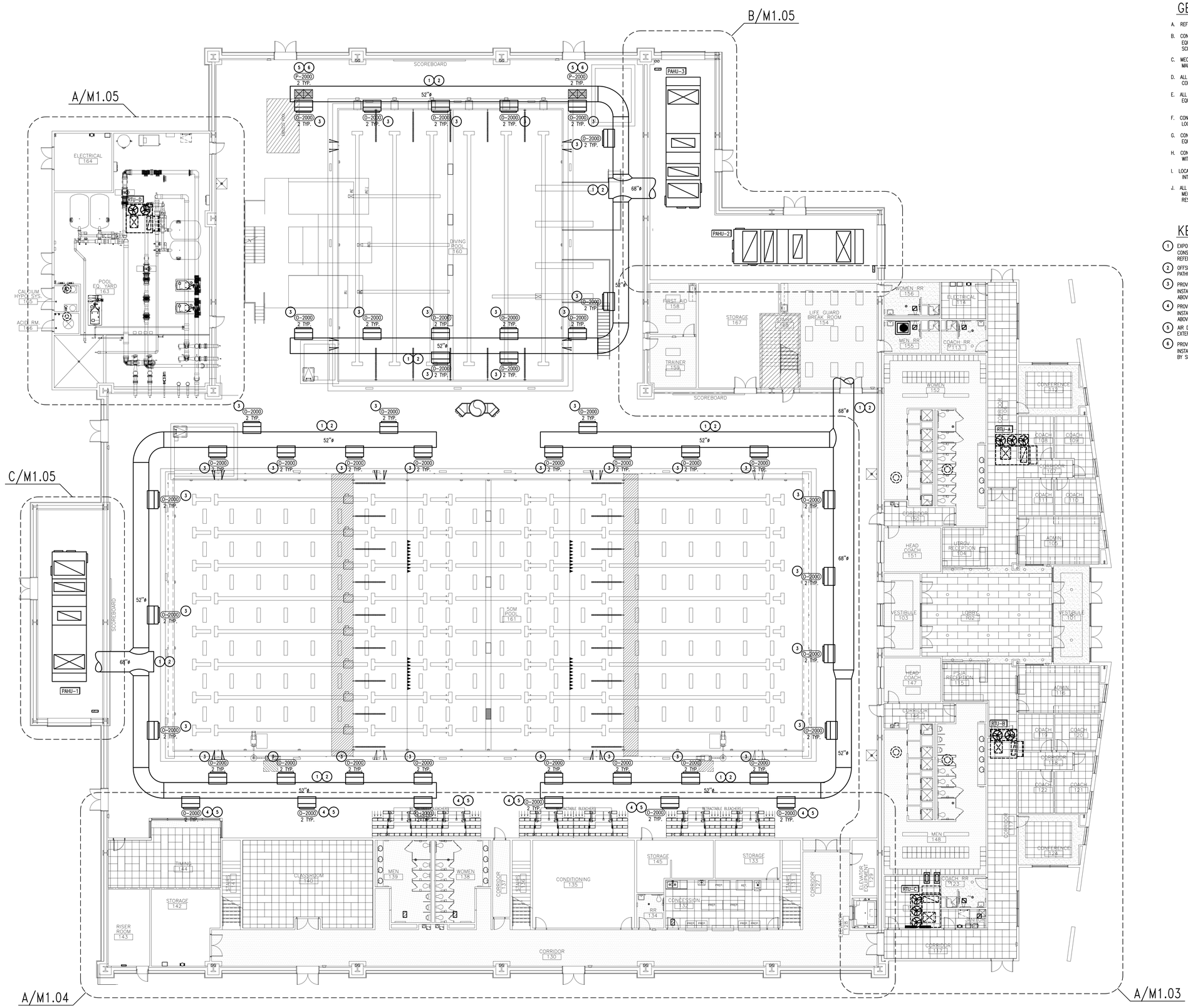
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

M1.00
MECHANICAL SITE PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A MECHANICAL FLOOR PLAN
SCALE: 3/32" = 1'-0" 1ST FLOOR

GENERAL NOTES:

A. REFER TO SCHEDULE SHEET FOR ADDITIONAL GENERAL MECHANICAL NOTES.

B. CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSITIONS FROM MECHANICAL EQUIPMENT TO DUCTS. VERIFY EQUIPMENT OUTLET/INLET SIZE WITH SCHEDULE.

C. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ACCESS CLEARANCES FOR ALL MECHANICAL EQUIPMENT.

D. ALL DUCTWORK SERVING POOL DEHUMIDIFICATION UNITS SHALL BE ALUMINUM CONSTRUCTION.

E. ALL EXPOSED DUCTWORK LOCATED WITHIN THE AQUATIC AREAS AND POOL EQUIPMENT ROOM SHALL BE DOUBLE WALL OF ALUMINUM CONSTRUCTION.

F. CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL MECHANICAL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.

G. CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORTS FOR ALL MECHANICAL EQUIPMENT SUSPENDED FROM STRUCTURE.

H. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATIONS AND ROOFING WORK WITH ROOFING CONTRACTOR AS REQUIRED TO MAINTAIN ROOF WARRANTY.

I. LOCATE EXHAUST HOODS/FANS MINIMUM 10-FEET FROM ANY OUTSIDE AIR INTAKE.

J. ALL HANGERS AND SUPPORTS LOCATED WITHIN THE AQUATIC AREAS, MECHANICAL ROOMS, AND POOL EQUIPMENT ROOMS SHALL BE CORROSION RESISTANT HOT DIPPED GALVANIZED SYSTEMS.

KEY NOTES:

1. EXPOSED DUCT SHALL BE 2-INCH DOUBLE WALL SPIRAL PIPE OF ALUMINUM CONSTRUCTION. ROUTE DUCTWORK BETWEEN/THRU STRUCTURAL WEBBING. REFER TO ARCHITECTURAL ELEVATIONS.
2. OFFSET DUCTWORK AS REQUIRED TO AVOID STRUCTURAL SYSTEMS. COORDINATE PATHWAY WITH STRUCTURAL TRADE.
3. PROVIDE AND INSTALL 60" X 30" TAP-OFF WITH 45° TURN DOWN TO ALLOW FOR INSTALLATION OF TWO 50" X 10" AIR DEVICES WHICH SHALL BE MOUNTED ONE ABOVE ANOTHER. REFER TO DETAIL.
4. PROVIDE AND INSTALL 60" X 30" TAP-OFF WITH 30° TURN DOWN TO ALLOW FOR INSTALLATION OF TWO 50" X 10" AIR DEVICES WHICH SHALL BE MOUNTED ONE ABOVE ANOTHER. REFER TO DETAIL.
5. AIR DEVICES SHALL BE ADJUSTED SUCH THAT THEY DISCHARGE AIR ONTO EXTERIOR GLASS.
6. PROVIDE AND INSTALL 70" X 36" TAP-OFF (VERTICAL) TO ALLOW FOR INSTALLATION OF TWO 30" X 30" AIR DEVICES WHICH SHALL BE MOUNTED SIDE BY SIDE.

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

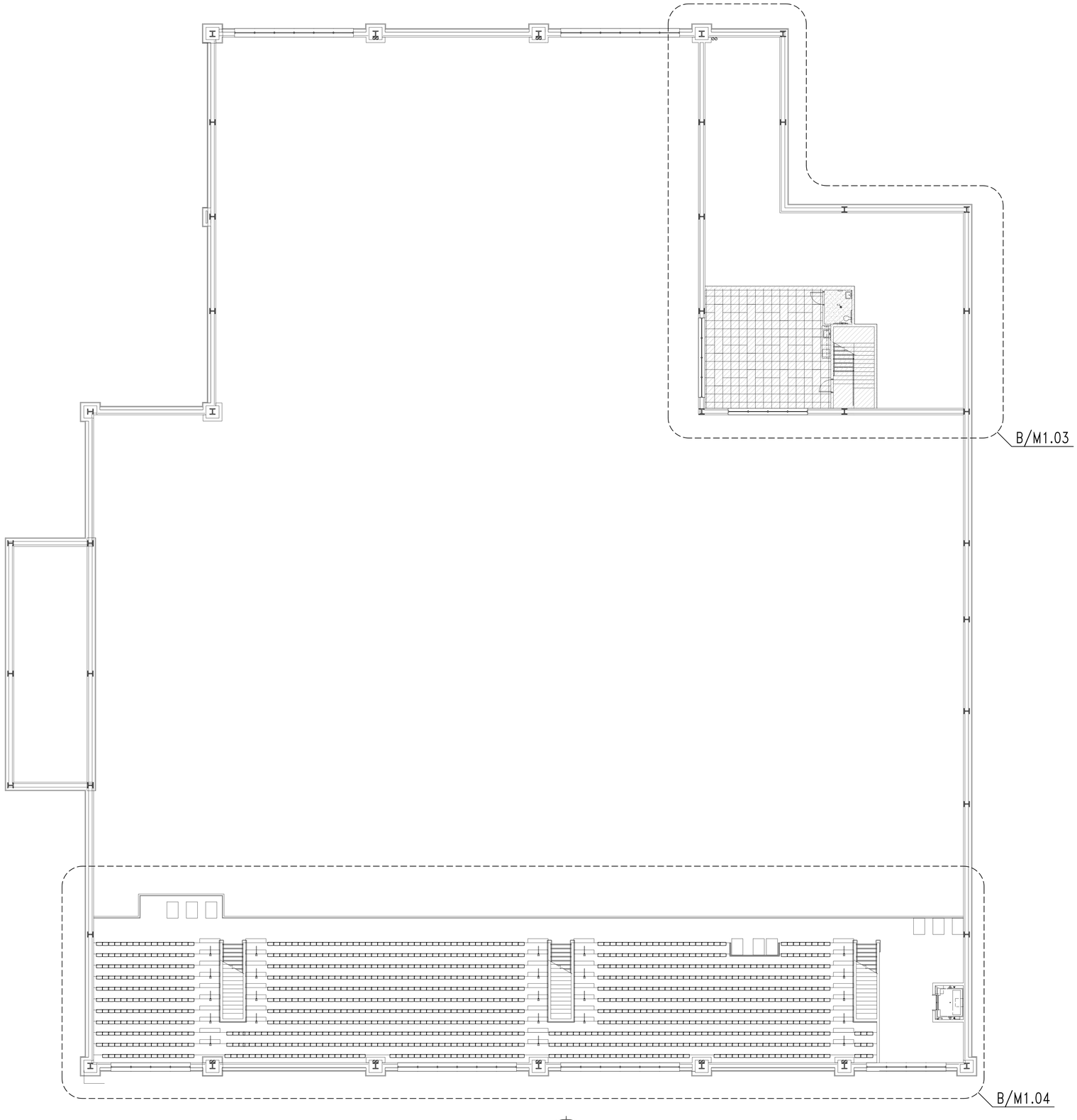
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

M1.01
MECHANICAL FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A MECHANICAL FLOOR PLAN
SCALE: 3/32" = 1'-0" 2ND FLOOR

NORTH

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

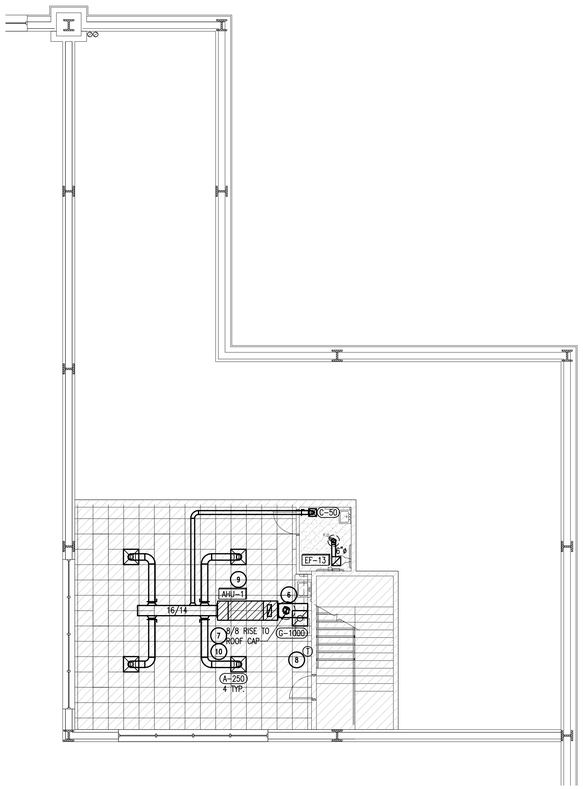
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

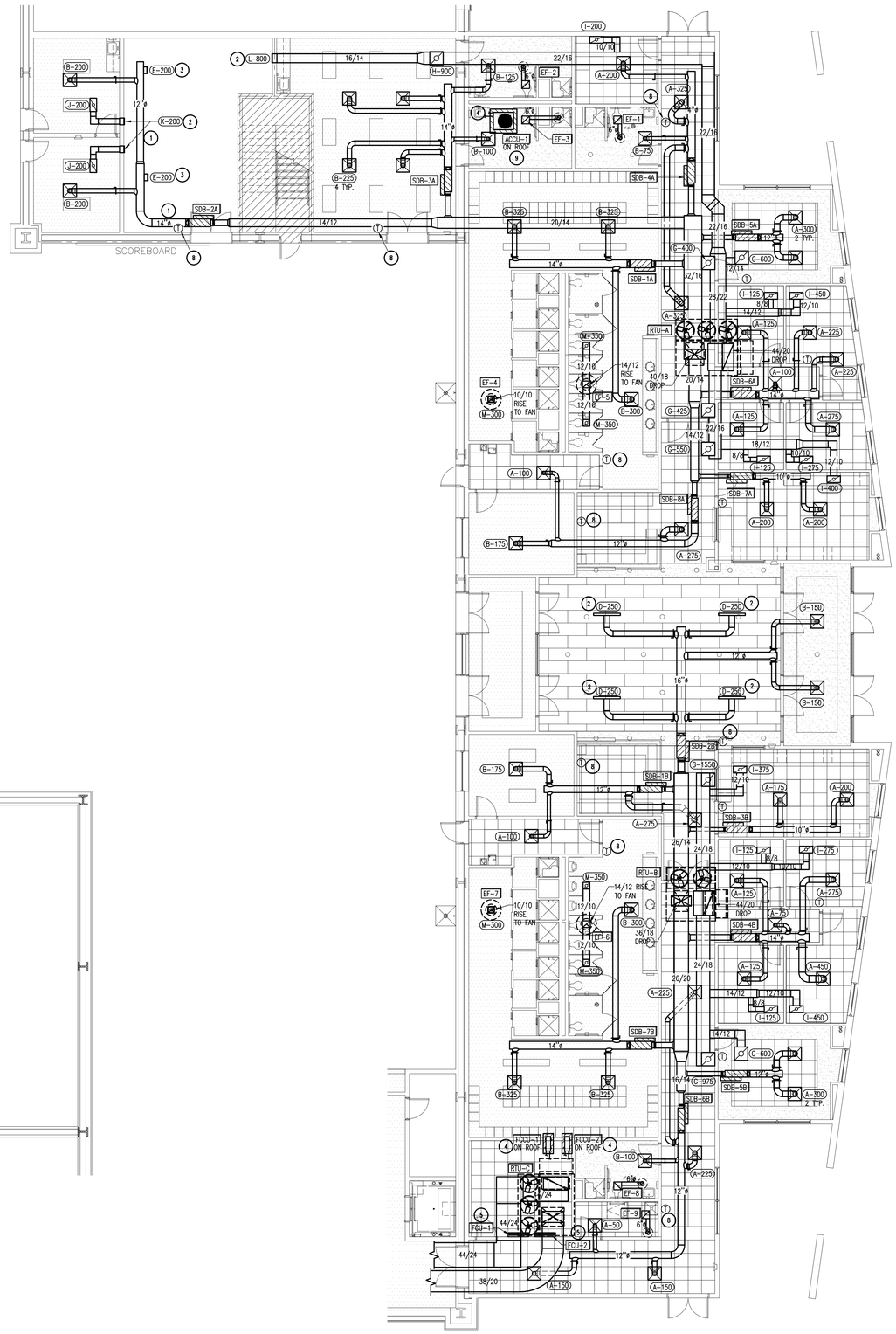
M1.02

MECHANICAL
MEZZANINE PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



B MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 2ND FLOOR



A MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 1ST FLOOR

GENERAL NOTES:

A. REFER TO SCHEDULE SHEET FOR ADDITIONAL GENERAL MECHANICAL NOTES.

B. CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSITIONS FROM MECHANICAL EQUIPMENT TO DUCTS. VERIFY EQUIPMENT OUTLET/INLET SIZE WITH SCHEDULE.

C. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ACCESS CLEARANCES FOR ALL MECHANICAL EQUIPMENT.

D. CONCEALED DUCTS SHALL BE SHEETMETAL SINGLE WALL TYPE WITH EXTERNAL WRAP INSULATION UNLESS OTHERWISE NOTED.

E. ALL EXPOSED (VISIBLE) DUCT SHALL BE SHEETMETAL SINGLE WALL INTERNALLY LINED TYPE AND SURFACED FOR PAINTING. COLOR SELECTION BY ARCHITECT. (NO EXPOSED FLEX DUCT SHALL BE ALLOWED).

F. CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL MECHANICAL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.

G. CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORTS FOR ALL MECHANICAL EQUIPMENT SUSPENDED FROM STRUCTURE.

H. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATIONS AND ROOFING WORK WITH ROOFING CONTRACTOR AS REQUIRED TO MAINTAIN ROOF WARRANTY.

I. LOCATE EXHAUST HOODS/FANS MINIMUM 10-FEET FROM ANY OUTSIDE AIR INTAKE.

J. RETURN AIR DUCT BRANCH TO AIR DEVICE SHALL BE FURNISHED WITH MANUAL BALANCING DAMPER (ONE PER AIR DEVICE).

KEY NOTES:

1. EXPOSED DUCT SHALL BE SHEETMETAL SINGLE WALL INTERNALLY LINED TYPE AND SURFACED FOR PAINTING. COORDINATE COLOR SELECTION WITH ARCHITECT.
2. AIR DEVICE MOUNTED ON WALL/CEILING SURFACE SHALL BE PAINTED TO MATCH WALL/CEILING COLOR.
3. AIR DEVICE MOUNTED ON EXPOSED DUCTS SHALL BE PAINTED TO MATCH DUCT COLOR.
4. PROVIDE AND INSTALL REFRIGERANT LINES PER MANUFACTURER RECOMMENDATIONS. PROVIDE INSULATION ON RETURN LINES. REFRIGERANT LINES LOCATED ON EXTERIOR SHALL BE PROVIDED WITH ALUMINUM JACKET. ROUTE REFRIGERANT LINES TO ASSOCIATED AIR HANDLING UNIT(S).
5. REFRIGERANT LINES, CONDENSATE LINE, CONTROL WIRING, AND ELECTRICAL SERVICE SERVING WALL MOUNTED UNIT SHALL BE CONCEALED IN WALL. REFER TO DETAIL.
6. PROVIDE RETURN AIR PLENUM OF EQUAL SIZE OF UNIT OPENING.
7. RISE DUCT UP TO OUTSIDE AIR INTAKE HOOD. HOOD SHALL BE ALUMINUM CONSTRUCTION EQUAL TO COOK MODEL "12-PR". FURNISH HOOD WITH CURB.
8. TEMPERATURE SENSOR SHALL BE LOCATED 12"-INCHES BELOW CEILING. PROVIDE WITH METAL TAMPER-PROOF ENCLOSURE.
9. AIR HANDLING UNIT AND ASSOCIATED CONDENSER SYSTEM SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
10. PROVIDE MANUAL BALANCING DAMPER (WITH LOCKING QUADRANT) AND CONTROL DAMPER ON OUTSIDE AIR DUCT. CONTROL DAMPER SHALL BE EQUAL TO A RUSKIN MODEL "CD40". FURNISH WITH 2-POSITION ACTUATOR.

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

M1.03
MECHANICAL FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

GENERAL NOTES:

A. REFER TO SCHEDULE SHEET FOR ADDITIONAL GENERAL MECHANICAL NOTES.

B. CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSITIONS FROM MECHANICAL EQUIPMENT TO DUCTS. VERIFY EQUIPMENT OUTLET/INLET SIZE WITH SCHEDULE.

C. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ACCESS CLEARANCES FOR ALL MECHANICAL EQUIPMENT.

D. CONCEALED DUCTS SHALL BE SHEETMETAL SINGLE WALL TYPE WITH EXTERNAL WRAP INSULATION UNLESS OTHERWISE NOTED.

E. ALL EXPOSED (VISIBLE) DUCT SHALL BE SHEETMETAL SINGLE WALL INTERNALLY LINED TYPE AND SURFACED FOR PAINTING. COLOR SELECTION BY ARCHITECT. (NO EXPOSED FLEX DUCT SHALL BE ALLOWED).

F. CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL MECHANICAL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.

G. CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORTS FOR ALL MECHANICAL EQUIPMENT SUSPENDED FROM STRUCTURE.

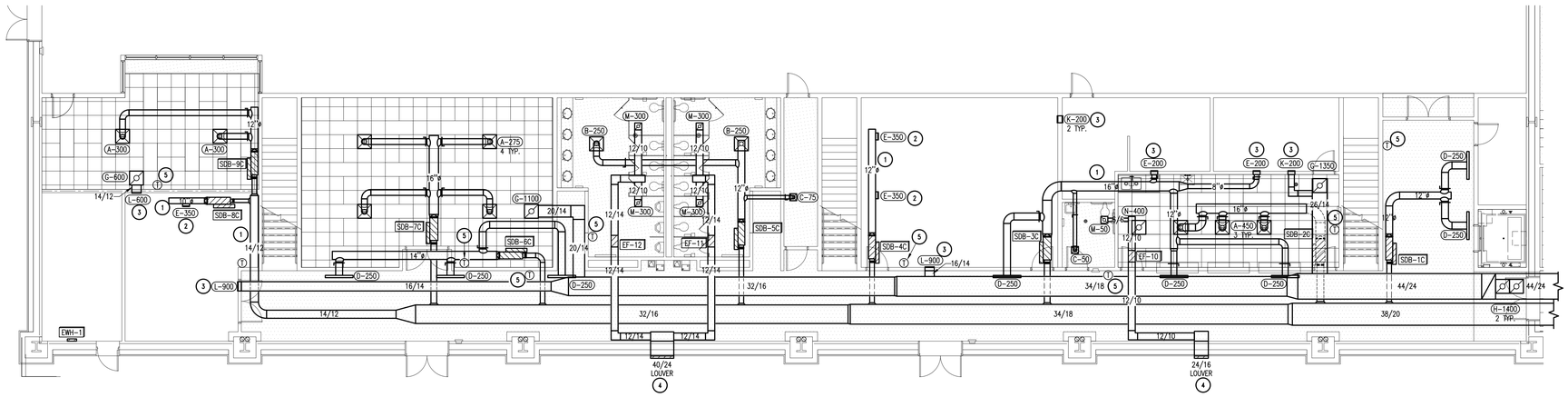
H. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATIONS AND ROOFING WORK WITH ROOFING CONTRACTOR AS REQUIRED TO MAINTAIN ROOF WARRANTY.

I. LOCATE EXHAUST HOODS/FANS MINIMUM 10-FEET FROM ANY OUTSIDE AIR INTAKE.

J. RETURN AIR DUCT BRANCH TO AIR DEVICE SHALL BE FURNISHED WITH MANUAL BALANCING DAMPER (ONE PER AIR DEVICE).

KEY NOTES:

1. EXPOSED DUCT SHALL BE SHEETMETAL SINGLE WALL INTERNALLY LINED TYPE AND SURFACED FOR PAINTING. COORDINATE COLOR SELECTION WITH ARCHITECT.
2. AIR DEVICE MOUNTED ON EXPOSED DUCTS SHALL BE PAINTED TO MATCH DUCT COLOR.
3. AIR DEVICE MOUNTED ON WALL SURFACE SHALL BE PAINTED TO MATCH WALL COLOR.
4. PROVIDE AND INSTALL LOUVER EQUAL TO A GREENHECK MODEL "EVH-501". FURNISH WITH KYNAR FINISH, INSECT SCREEN, FLANGED FRAME, AND ALUMINUM CONSTRUCTION. COORDINATE COLOR SELECTION W/ ARCHITECT. LOUVER OCCURS TWICE, ONE ABOVE THE OTHER. REFER TO ELEVATIONS.
5. TEMPERATURE SENSOR SHALL BE LOCATED 12"-INCHES BELOW CEILING. PROVIDE WITH METAL TAMPER-PROOF ENCLOSURE.



NORTH

A MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 1ST FLOOR

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

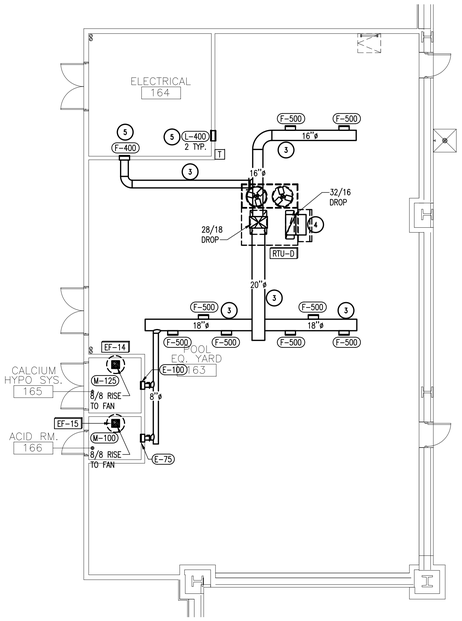
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

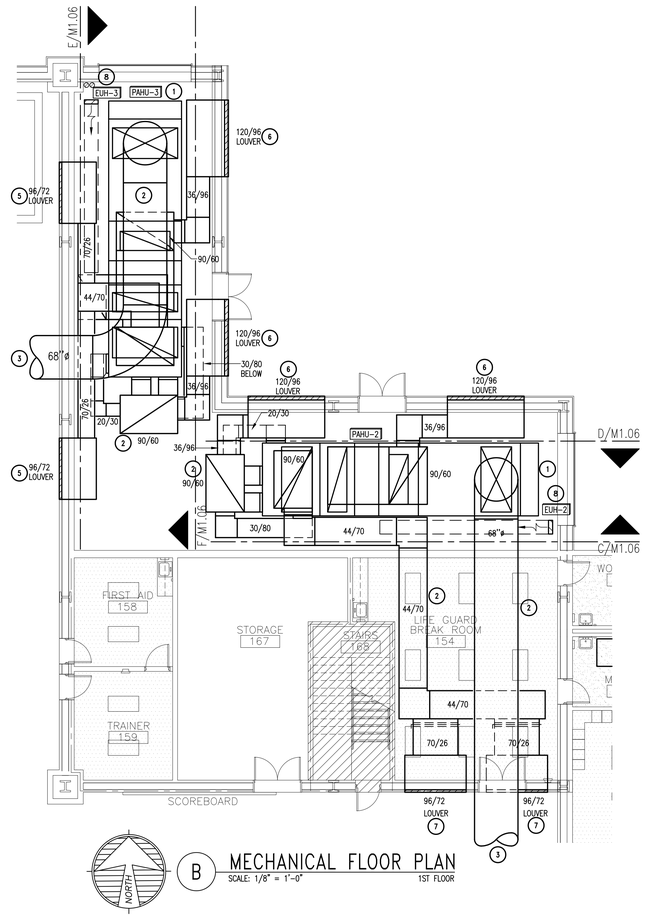
PROJECT 971805
DATE 06/07/2019
REVISED

M1.04
MECHANICAL FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 1ST FLOOR



B MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 1ST FLOOR

GENERAL NOTES:

A. REFER TO SCHEDULE SHEET FOR ADDITIONAL GENERAL MECHANICAL NOTES.

B. CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSITIONS FROM MECHANICAL EQUIPMENT TO DUCTS. VERIFY EQUIPMENT OUTLET/INLET SIZE WITH SCHEDULE.

C. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ACCESS CLEARANCES FOR ALL MECHANICAL EQUIPMENT.

D. ALL DUCTWORK SERVING POOL DEHUMIDIFICATION UNITS SHALL BE ALUMINUM CONSTRUCTION.

E. ALL EXPOSED DUCTWORK LOCATED WITHIN THE AQUATIC AREAS AND POOL EQUIPMENT ROOM SHALL BE DOUBLE WALL OF ALUMINUM CONSTRUCTION.

F. CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL MECHANICAL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.

G. CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORTS FOR ALL MECHANICAL EQUIPMENT SUSPENDED FROM STRUCTURE.

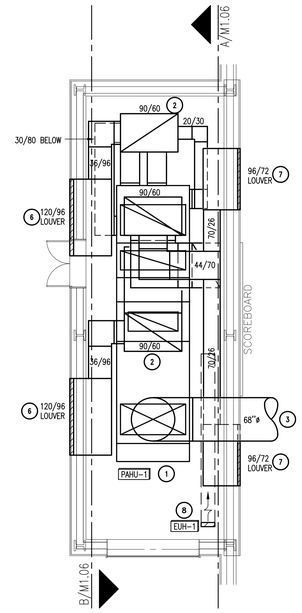
H. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATIONS AND ROOFING WORK WITH ROOFING CONTRACTOR AS REQUIRED TO MAINTAIN ROOF WARRANTY.

I. LOCATE EXHAUST HOODS/FANS MINIMUM 10-FEET FROM ANY OUTSIDE AIR INTAKE.

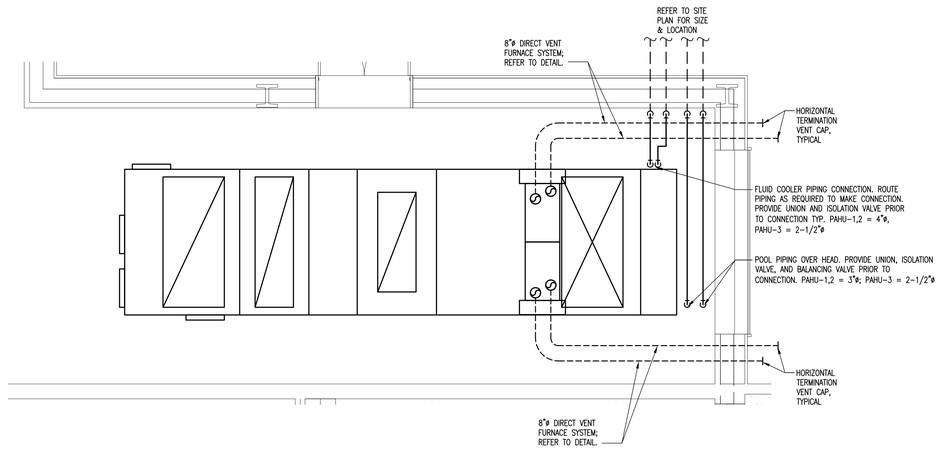
J. ALL HANGERS AND SUPPORTS LOCATED WITHIN THE AQUATIC AREAS, MECHANICAL ROOMS, AND POOL EQUIPMENT ROOMS SHALL BE CORROSION RESISTANT HOT DIPPED GALVANIZED SYSTEMS.

KEY NOTES:

1. AIR HANDLING UNIT SHALL BE MOUNTED ON 6-INCH HIGH CONCRETE PAD. PAD SHALL EXTEND 6-INCHES BEYOND EQUIPMENT PERIMETER.
2. ALL DUCTWORK INSIDE OF MECHANICAL ROOMS AND/OR CONCEALED FROM VIEW SHALL BE SINGLE WALL ALUMINUM CONSTRUCTION WITH 2-INCH FIBERGLASS DUCTBOARD INSULATION WITH FSK FOILFACE.
3. EXPOSED DUCTWORK SHALL BE 2-INCH DOUBLE WALL OF ALUMINUM CONSTRUCTION.
4. PROVIDE RETURN AIR DUCT OF EQUAL SIZE OF UNIT OPENING; DROP DUCT 12-INCHES BELOW ROOF STRUCTURE AND TERMINATE WITH BIRD SCREEN.
5. AIR DEVICE MOUNTED ON WALL SURFACE SHALL BE PAINTED TO MATCH WALL COLOR.
6. PROVIDE AND INSTALL LOUVER EQUAL TO A GREENHECK MODEL "EVH-501". FURNISH WITH KYNAR FINISH, INSECT SCREEN, FLANGED FRAME, AND ALUMINUM CONSTRUCTION. COORDINATE COLOR SELECTION W/ ARCHITECT. LOUVER OCCURS TWICE, ONE ABOVE THE OTHER. REFER TO ELEVATIONS.
7. PROVIDE AND INSTALL LOUVER EQUAL TO A GREENHECK MODEL "ESD-635". FURNISH WITH KYNAR FINISH, FLANGED FRAME, AND ALUMINUM CONSTRUCTION. COORDINATE COLOR SELECTION WITH ARCHITECT. LOUVER OCCURS TWICE, ONE ABOVE ANOTHER, REFER TO ELEVATIONS.
8. UNIT HEATER SHALL BE LOCATED MINIMUM 10-FEET ABOVE FINISHED FLOOR. MOUNT HEATER ONTO STRUCTURAL BEAM. PROVIDE ALL CONTROL WIRING AS REQUIRED FOR A FULLY FUNCTIONAL SYSTEM. REFER TO MANUFACTURER RECOMMENDATIONS.



C MECHANICAL FLOOR PLAN
SCALE: 1/8" = 1'-0" 1ST FLOOR



D TYPICAL POOL AIR HANDLING UNIT PIPING DETAIL
SCALE: 1/4" = 1'-0"

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

M1.05

MECHANICAL FLOOR PLAN

GENERAL NOTES:

A. REFER TO SCHEDULE SHEET FOR ADDITIONAL GENERAL MECHANICAL NOTES.

B. CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSITIONS FROM MECHANICAL EQUIPMENT TO DUCTS. VERIFY EQUIPMENT OUTLET/INLET SIZE WITH SCHEDULE.

C. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES TO MAINTAIN ACCESS CLEARANCES FOR ALL MECHANICAL EQUIPMENT.

D. ALL DUCTWORK SERVING POOL DEHUMIDIFICATION UNITS SHALL BE ALUMINUM CONSTRUCTION.

E. ALL EXPOSED DUCTWORK LOCATED WITHIN THE AQUATIC AREAS AND POOL EQUIPMENT ROOM SHALL BE DOUBLE WALL OF ALUMINUM CONSTRUCTION.

F. CONTRACTOR SHALL PROVIDE ACCESS PANELS FOR ALL MECHANICAL EQUIPMENT LOCATED ABOVE INACCESSIBLE CEILINGS.

G. CONTRACTOR SHALL PROVIDE STRUCTURAL SUPPORTS FOR ALL MECHANICAL EQUIPMENT SUSPENDED FROM STRUCTURE.

H. CONTRACTOR SHALL COORDINATE ALL ROOF PENETRATIONS AND ROOFING WORK WITH ROOFING CONTRACTOR AS REQUIRED TO MAINTAIN ROOF WARRANTY.

I. LOCATE EXHAUST HOODS/FANS MINIMUM 10-FEET FROM ANY OUTSIDE AIR INTAKE.

J. ALL HANGERS AND SUPPORTS LOCATED WITHIN THE AQUATIC AREAS, MECHANICAL ROOMS, AND POOL EQUIPMENT ROOMS SHALL BE CORROSION RESISTANT HOT DIPPED GALVANIZED SYSTEMS.

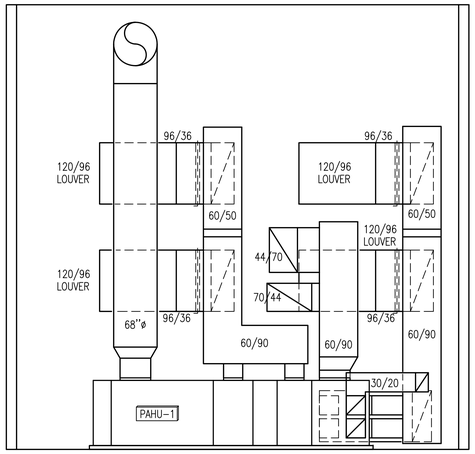
K. PROVIDE FLEXIBLE CONNECTION FROM UNIT ONTO DUCTWORK.

L. PROVIDE NEOPRENE VIBRATION ISOLATOR BETWEEN UNIT AND CONCRETE PAD. LOCATE MINIMUM 3-FEET ON CENTER.

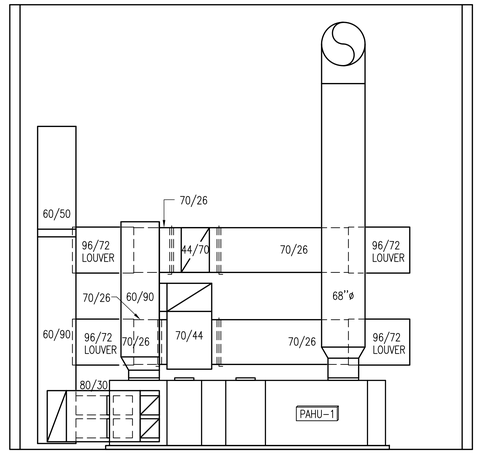
M. PROVIDE FULL SIZE DUCT FROM UNIT OPENINGS AND CONNECT TO DISTRIBUTION DUCTS SHOWN.

N. ALL DUCTWORK INSIDE OF MECHANICAL ROOMS AND/OR CONCEALED FROM VIEW SHALL BE SINGLE WALL ALUMINUM CONSTRUCTION WITH 2-INCH FIBERGLASS DUCTBOARD INSULATION WITH FSK FOIL FACE.

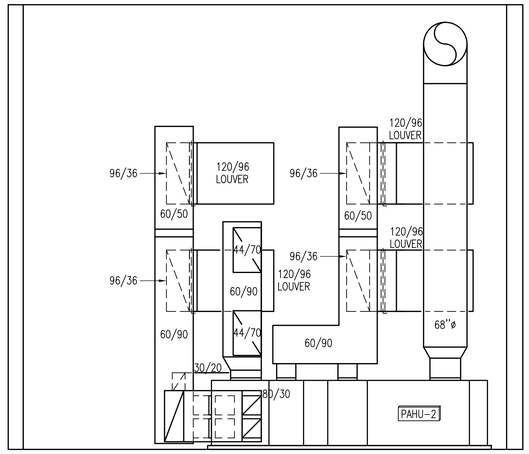
O. NOT ALL PORTIONS OF DUCTWORK ARE SHOWN ON ELEVATION VIEWS TO ALLOW FOR CLARITY. COORDINATE WITH PLAN VIEW DRAWINGS.



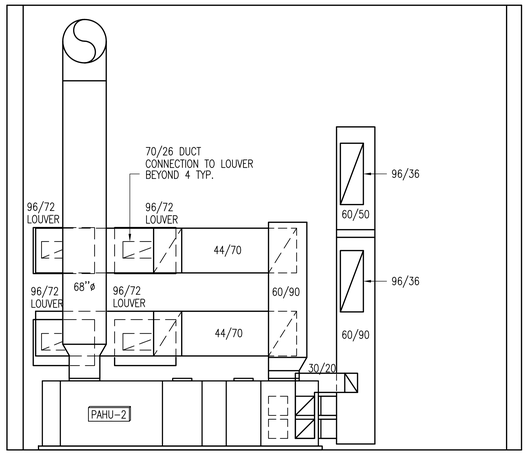
A INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"



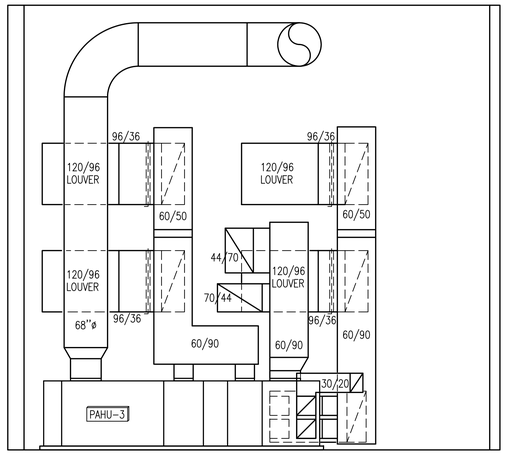
B INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"



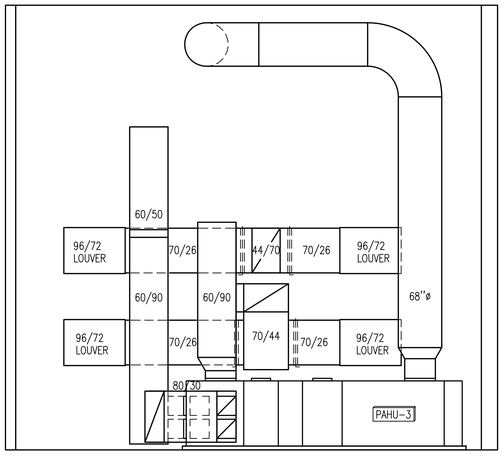
C INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"



D INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"



E INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"



F INTERIOR ELEVATION @ MECHANICAL ROOM
SCALE: 1/8" = 1'-0"

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

M1.06

MECHANICAL ROOM
INTERIOR ELEVATIONS

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

GENERAL MECHANICAL NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC ONLY AND SHALL NOT BE SCALED. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL CONSTRUCTION EFFORTS. PROVIDE ALL NECESSARY OFFSETS AND FITTINGS AS REQUIRED BY FIELD CONDITIONS.

2. CONTRACTOR SHALL HANG AND INSTALL ALL DUCTWORK TIGHT WITH THE BUILDING STRUCTURE TO ACCOMODATE CEILINGS. CONTRACTOR SHALL COORDINATE INSTALLATION WORK WITH ALL OTHER TRADES. ALL DUCTWORK SHALL BE MODIFIED AS REQUIRED TO FIT AROUND BUILDING STRUCTURES.

3. CONTRACTOR SHALL BALANCE ALL AIR DISTRIBUTION SYSTEMS TO ACHIEVE THE AIR VOLUME REQUIREMENTS AS INDICATED. BALANCING SHALL INCLUDE ADJUSTMENT OF ALL MANUAL VOLUME DAMPERS AND INDIVIDUAL DIFFUSER DAMPERS.

4. CONTRACTOR SHALL MOUNT ALL THERMOSTATS 48-INCHES ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED. COORDINATE THE FINAL LOCATION OF EACH THERMOSTAT WITH ROOM FINISHES. PROVIDE ALL CONTROL VOLTAGE WIRING FOR THERMOSTAT INSTALLATION.

5. CONTRACTOR SHALL COORDINATE THE FINAL LOCATIONS OF ALL CEILING AIR DEVICES WITH LIGHTING INSTALLATIONS AND ARCHITECTURAL CEILING PLANS. AIR DEVICES SHALL BE RELOCATED IF REQUIRED TO AVOID OBSTRUCTION WITH DUCTWORK AND LIGHT FIXTURES.

6. PROVIDE SMOKE DETECTORS AND SHUTDOWN CONTROLS ON AIR HANDLING UNITS. SMOKE DETECTORS SHALL BE PROVIDED, INSTALLED, AND WIRED FOR SHUTDOWN BY DIVISION 16.

GENERAL ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
AFF	ABOVE FINISHED FLOOR	KW	KILOWATTS
AHU	AIR HANDLING UNIT	L	LOUVER
ACCU	AIR COOLED CONDENSING UNIT	MAX	MAXIMUM
DB	DRY BULB	MIN	MINIMUM
EDH	ELECTRIC DUCT HEATER	NTS	NOT TO SCALE
EF	EXHAUST FAN	OBD	OPPOSED BLADE DAMPER
FCU	FAN COIL UNIT	S.P.	STATIC PRESSURE
FCCU	FAN COOLED CONDENSING UNIT	WB	WET BULB

MECHANICAL SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
T	TEMPERATURE SENSOR		EXHAUST AIR DUCT
	SUPPLY AIR DEVICE (SEE SCHEDULE)		RETURN AIR DUCT
	RETURN/TRANSFER AIR DEVICE (SEE SCHEDULE)		SUPPLY AIR DUCT
	EXHAUST FAN (SEE SCHEDULE)	X/X	DUCT INTERNAL DIMENSIONS (WIDTH/DEPTH)
	RECTANGULAR DUCT TRANSITION		ROUND BRANCH DUCT WITH MANUAL BALANCING DAMPER
	ROUND FLEX DUCT		ROOF TOP UNIT (SEE SCHEDULE)
T AVG.	AVERAGING TEMPERATURE SENSOR	T	THERMOSTAT

NECK/BRANCH DUCT SIZE CHART

SUPPLY DUCT			RETURN DUCT		
NECK/BRANCH SIZE		CFM RANGE	NECK/BRANCH SIZE		CFM RANGE
6" DIAMETER	6/6 DUCT	0 – 100	6" DIAMETER	6/6 DUCT	0 – 75
8" DIAMETER	12/6 DUCT	101 – 225	8" DIAMETER	12/6 DUCT	76 – 150
10" DIAMETER	12/8 DUCT	226 – 400	10" DIAMETER	12/8 DUCT	151 – 275
12" DIAMETER	12/10 DUCT	401 – 675	12" DIAMETER	12/10 DUCT	276 – 475
14" DIAMETER	14/12 DUCT	676 – 1000	14" DIAMETER	14/12 DUCT	476 – 700
16" DIAMETER	18/12 DUCT	1001 – 1400	16" DIAMETER	18/12 DUCT	701 – 1000
18" DIAMETER	24/12 DUCT	1401 – 2000	18" DIAMETER	24/12 DUCT	1001 – 1300
20" DIAMETER	24/14 DUCT	2001 – 2500	20" DIAMETER	24/14 DUCT	1301 – 1800
22" DIAMETER	20/22 DUCT	2501 – 3200	22" DIAMETER	22/20 DUCT	1801 – 2300
24" DIAMETER	22/24 DUCT	3201 – 4200	24" DIAMETER	24/22 DUCT	2301 – 2800
			26" DIAMETER	24/24 DUCT	2801 – 3600
			28" DIAMETER	26/26 DUCT	3601 – 4200

ELECTRIC WALL HEATER SCHEDULE

DESIGNATION	SERVES	CAPACITY BTU/HR	TOTAL K.W.	VOLTAGE/PHASE	AMPS	MANUFACTURER	MODEL
EWH-1	RISER ROOM	10,235	3	208/1ø	14.4	QMARK	AWH4404

NOTES:
1. HEATERS ARE SHIPPED AT HIGHER WATTAGE; UNITS SHALL BE CONVERTED TO SPECIFIED WATTAGE IN THE FIELD.
2. HEATING ELEMENT SHALL BE ENCASED IN STEEL FINNED CASTING AND PROTECTED BY THERMAL SWITCH.
3. FAN MOTOR SHALL BE HEAVY DUTY ENCLOSED AND PERMANENTLY LUBRICATED.
4. FAN SHALL BE PRECISION BALANCED AND FAN-MOTOR ASSEMBLY MOUNTED TO BE VIBRATION FREE.
5. UNITS SHALL BE CONTROLLED AUTOMATICALLY BY INTEGRAL THERMOSTAT WHEN HEATER IS IN "ON" POSITION.
6. HEATER SHALL HAVE BUILT-IN FAN DELAY.
7. FINISH: BAKED-ON ENAMEL.
8. UNIT SHALL BE RECESSED IN WALL.

AIR DEVICE SCHEDULE

DESIGNATION	SIZE	MOUNTING	THROW	NECK TYPE	CONSTRUCTION	OBD	MAX NC	FINSH	MANUFACTURER	MODEL
A	24 X 24	LAY-IN	4-WAY	ROUND	ALUMINUM	YES	30	#26 WHITE	PRICE	ASPD
B	24 X 24	SURFACE	4-WAY	ROUND	ALUMINUM	YES	30	#26 WHITE	PRICE	ASPD
C	12 X 12	LAY-IN	4-WAY	ROUND	ALUMINUM	YES	30	#26 WHITE	PRICE	ASPD
D	48 X 4	SURFACE	2-SLOT	12"ø	ALUMINUM	YES	30	#26 WHITE	PRICE	TBD-375
E	12 X 6	SURFACE	2-WAY	–	ALUMINUM	YES	30	#26 WHITE	PRICE	620
F	16 X 8	SURFACE	2-WAY	–	ALUMINUM	YES	30	#26 WHITE	PRICE	620
G	24 X 24	LAY-IN	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	80
H	24 X 24	SURFACE	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	80
I	24 X 12	LAY-IN	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	80
J	24 X 12	SURFACE	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	80
K	12 X 6	SURFACE	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	630
L	16 X 16	SURFACE	–	–	ALUMINUM	NO	30	#26 WHITE	PRICE	630
M	12 X 12	SURFACE	–	–	ALUMINUM	YES	30	#26 WHITE	PRICE	635
N	12 X 12	LAY-IN	–	–	ALUMINUM	YES	30	#26 WHITE	PRICE	635
O	50 X 10	SURFACE	–	–	ALUMINUM	YES	30	#26 WHITE	PRICE	AHCD1
P	30 X 30	SURFACE	2-WAY	–	ALUMINUM	YES	30	#26 WHITE	PRICE	620

LEGEND: CFM / A-200 / DESIGNATION

NOTES:
1. SIZE SHALL INCLUDE MODULE WITH FULL FACE.
2. COORDINATE AIR DEVICE TYPE WITH ARCHITECTURAL CEILINGS.
3. NECK SIZE PER NECK/BRANCH DUCT SIZE CHART.
4. PLENUM SLOT DIFFUSER SHALL BE FURNISHED WITH 3/4-INCH SLOTS, INSULATED PLENUM, AND PATTERN CONTROLLERS. DIFFUSERS MOUNTED ON CURVED SURFACE SHALL MATCH SURFACE CURVATURE.

DEHUMIDIFICATION AIR COOLED FLUID COOLER SCHEDULE

FLUID COOLER UNIT DESIGNATION	PAFC-1	PAFC-2	PAFC-3
SPACE SERVED	COMPETITION POOL	COMPETITION POOL	DIVE POOL
UNIT LOCATION	OUTDOOR	OUTDOOR	OUTDOOR
DESIGN AMBIENT TEMPERATURE (°F DB)	100°F	100°F	100°F
CAPACITY (MBH)	1314.1	1314.1	652.9
VOLTAGE/PHASE	460/3ø	460/3ø	460/3ø
FAN MOTOR HP.	8 @ 3.4	8 @ 3.4	4 @ 3.4
FAN MOTOR FLA (EACH)	4.2	4.2	4.2
UNIT MCA/MOCP	36/40	36/40	19/25
MANUFACTURER	SERESCO	SERESCO	SERESCO
MODEL	NG-V-48	NG-V-48	NG-V-22
UNIT WEIGHT (LBS)	4,000	4,000	2,400
REMARKS	1,2,3,4	1,2,3,4	1,2,3,4

REMARKS
1. PROVIDE UNIT MOUNTED DISCONNECT WITH SINGLE POINT POWER WIRING.
2. PROVIDE UNIT MOUNTED GFCI 120 VOLT SERVICE RECEPTACLE. POWER TO BE FIELD WIRED.
3. PROVIDE UNITARY CONTROLLER WITH WEB ACCESS AND BACNET IP INTERFACE.
4. SEE SPECIFICATION FOR CONSTRUCTION AND OTHER REQUIREMENTS.

ELECTRIC UNIT HEATER SCHEDULE

DESIGNATION	EUH-1	EUH-2	EUH-3	
CFM	700	700	700	
DRIVE TYPE	DIRECT	DIRECT	DIRECT	
FAN TYPE	AXIAL	AXIAL	AXIAL	
CAPACITY (BTUH)	33,800	33,800	33,800	
KW	10.0	10.0	10.0	
VOLTAGE/PHASE	208/3ø	208/3ø	208/3ø	
AMPS	27.4	27.4	27.4	
MANUFACTURER	TPI CORPORATION	TPI CORPORATION	TPI CORPORATION	
MODEL	F2F5110CA1L	F2F5110CA1L	F2F5110CA1L	
UNIT WEIGHT (LBS)	55	55	55	
REMARKS	1,2,3,4	1,2,3,4	1,2,3,4	

REMARKS
1. PROVIDE WITH LINE VOLTAGE THERMOSTAT MODEL S2025. WIRING SHALL BE IN CONDUIT, REFER TO ELECTRICAL SPECIFICATIONS. MOUNT THERMOSTAT ON BACK BOX.
2. INSTALL PER MANUFACTURER RECOMMENDATIONS.
3. UNIT SHALL BE HORIZONTAL DISCHARGE.
4. PROVIDE WITH WALL BRACKET, DUST SHIELD, & FAN GUARD.

EXHAUST FAN SCHEDULE

DESIGNATION	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6	EF-7	EF-8	EF-9	EF-10	EF-11	EF-12	EF-13	EF-14	EF-15
EXHAUST CFM	150	150	150	300	700	700	300	150	100	500	700	700	100	125	100
EXTERNAL S.P. ("W.G.)	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
MOTOR HP.	171 WATTS	171 WATTS	171 WATTS	1/8	1/8	1/8	1/8	171 WATTS	25 WATTS	1/4	1/4	1/4	25 WATTS	1/4	1/4
MOTOR RPM	873	873	873	1182	1500	1500	1182	873	728	1537	1188	1188	728	1067	1011
DRIVE TYPE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	BELT	BELT	BELT	DIRECT	DIRECT	DIRECT
FAN TYPE	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL
MOUNTING LOCATION	CEILING	CEILING	CEILING	ROOF	ROOF	ROOF	ROOF	CEILING	CEILING	ABOVE CLG.	ABOVE CLG.	ABOVE CLG.	CEILING	ROOF	ROOF
SONES	3.0	3.0	3.0	5.8	8.4	8.4	5.8	3.0	2.0	11.8	9.1	9.1	2.0	4.2	3.7
VOLTAGE/PHASE	277/1ø	277/1ø	277/1ø	120/1ø	120/1ø	120/1ø	120/1ø	277/1ø	277/1ø	120/1ø	120/1ø	120/1ø	277/1ø	120/1ø	120/1ø
MANUFACTURER	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK
MODEL	SP-B150	SP-B150	SP-B150	G-095-G	G-095-D	G-095-D	G-095-G	SP-B150	SP-A200	BSQ-80-4	BSQ-100-4	BSQ-100-4	SP-A200	G-097-B	G-097-B
UNIT WEIGHT (LBS)	13	13	13	32	32	32	32	13	25	89	29	29	25	58	58
REMARKS	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,6,7,8	1,2,3,6,7,8	1,2,3,6,7,8	1,2,3,6,7,8	1,2,3,4,5	1,2,3,4,5	1,2,3,6,7,8	1,2,3,6,7,8	1,2,3,6,7,8	1,2,3,4,5	1,2,3,5,9,10	1,2,3,5,9,10

REMARKS
1. PROVIDE WITH INTERNAL DISCONNECT.
2. PROVIDE WITH BACK DRAFT DAMPER.
3. PROVIDE WITH FAN SPEED CONTROL.
4. SWITCH WITH LIGHTS.
5. PROVIDE WITH ROOF CAP AND CURB.
6. PROVIDE WITH ROOF CURB.
7. SWITCH WITH ENERGY MANAGEMENT SYSTEM.
8. PROVIDE WITH VIBRATION ISOLATORS AND BELT TENSIONER.
9. PROVIDE WITH INDIVIDUAL SWITCH.
10. PROVIDE ENTIRE FAN AND ACCESSORIES WITH HI-PRO POLYESTER COATING.

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT 971805
DATE 06/07/2019
REVISED

M2.01
MECHANICAL SCHEDULES

ROOF TOP UNIT SCHEDULE

ROOF TOP UNIT DESIGNATION	RTU-A	RTU-B	RTU-C	RTU-D
SUPPLY CFM	6425	5725	7125	4200
OUTSIDE AIR CFM	1250	1150	1400	850
EXTERNAL S.P. ("W.G.)	1.5	1.5	1.5	1.5
MOTOR HP.	–	–	–	–
TOTAL CAPACITY (MBH)	204.44	184.32	232.04	125.85
SENSIBLE CAPACITY (MBH)	169.01	152.00	190.71	108.49
ENTERING AIR (DB/WB)°F	78/64	78/64	78/64	78/64
LEAVING AIR (DB/WB)°F	54.48/53.21	55.54/53.63	54.70/53.32	55.30/54.13
CONDENSER AIR (DB)°F	98	98	98	98
HEATER CAPACITY (KW)	–	–	–	30
STAGES	–	–	–	2
VOLTAGE/PHASE	460/3ø	460/3ø	460/3ø	460/3ø
MCA/MOCP	47/60	43/50	52/60	55/60
MANUFACTURER	AAON	AAON	AAON	AAON
MODEL	RN-018	RN-015	RN-018	RN-011
UNIT WEIGHT (LBS)	2528	1824	2636	1758
EFFICIENCY EER (SEER)	12.5	11.4	12.5	12.8
REMARKS	1 thru 13	1 thru 13	1 thru 13	1 thru 13

REMARKS
1. PROVIDE 2" DOUBLE WALL CONSTRUCTION WITH R-13 FOAM INSULATION.
2. PROVIDE SINGLE POINT POWER.
3. PROVIDE WITH 14" TALL ROOF CURB WITH WIND LOAD RATING.
4. PROVIDE WITH HINGED ACCESS DOOR, FOIL FACE LINER, AND STAINLESS STEEL DRAIN PAN.
5. PROVIDE FACTORY COATED CONDENSER, EVAPORATOR, AND REHEAT COILS CAPABLE OF WHITHSTANDING 6,000 HRS SALT SPRAY PER ASTM B-117-90. FIELD APPLIED COATINGS NOT ALLOWED.
6. PROVIDE WITH FULLY MODULATING ECONOMIZER WITH ENTHALPY CONTROL.
7. PROVIDE WITH MODULATING HOT GAS REHEAT AND HUMIDITY CONTROL.
8. PROVIDE WITH SMOKE DETECTOR FOR UNITS OVER 2,000 CFM.
9. PROVIDE WITH FACTORY INSTALLED VFD AND CLASSIC MANUAL BYPASS.
10. PROVIDE WITH FACTORY INSTALLED NON FUSED DISCONNECT.
11. PROVIDE WITH FACTORY INSTALLED CONTROLLER WITH BACNET INTERFACE.
12. PROVIDE DIGITAL SCROLL COMPRESSOR ON FIRST CIRCUIT, 10% TO 100% MODULATING. PROVIDE FIXED SCROLL COMPRESSOR ON SECOND CIRCUIT WITH HOT GAS BYPASS.
13. PROVIDE FACTCORY INSTALLED EXTERIOR AND INTERIOR CORROSION COATING CAPABLE OF WITHSTANDING 2,500 HRS SALT SPRAY PER ASTM B-117-95.

SPLIT SYSTEM SCHEDULE

AIR HANDLING UNIT DESIGNATION	AHU-1	
SUPPLY CFM	1000	
OUTSIDE AIR CFM	150	
EXTERNAL S.P. ("W.G.)	0.4	
MOTOR HP.	1/3	
TOTAL CAPACITY (MBH)	35.02	
SENSIBLE CAPACITY (MBH)	27.67	
ENTERING AIR (DB/WB)°F	78/64	
LEAVING AIR (DB/WB)°F	53.08/51.92	
HEATER CAPACITY (KW)	10.5	
STAGES	1	
VOLTAGE/PHASE	208/1ø	
MCA/MOCP	67/70	
MANUFACTURER	AAON	
MODEL	H3ARB90161C	
UNIT WEIGHT (LBS)	539	
CONDENSING UNIT DESIGNATION	ACCU-1	
CONDENSER AIR (DB)°F	98	
VOLTAGE/PHASE	208/1ø	
MCA/MOCP	26/40	
MANUFACTURER	AAON	
MODEL	CB036	
UNIT WEIGHT (LBS)	237	
EFFICIENCY EER (SEER)	11.0	
REMARKS	1 thru 13	

REMARKS
1. PROVIDE 1" DOUBLE WALL CONSTRUCTION WITH R-6.5 FOAM INSULATION.
2. PROVIDE SINGLE POINT POWER.
3. PROVIDE WITH ROOF CURB FOR CONDENSING UNIT MOUNTING.
4. PROVIDE WITH HINGED ACCESS DOOR, FOIL FACE LINER, AND STAINLESS STEEL DRAIN PAN.
5. PROVIDE FACTORY COATED CONDENSER, EVAPORATOR, AND REHEAT COILS CAPABLE OF WHITHSTANDING 6,000 HRS SALT SPRAY PER ASTM B-117-90. FIELD APPLIED COATINGS NOT ALLOWED.
6. PROVIDE WITH FILTER MIXING BOX WITH ENTHALPY CONTROL.
7. PROVIDE WITH MODULATING HOT GAS REHEAT AND HUMIDITY CONTROL.
8. PROVIDE WITH SMOKE DETECTOR FOR UNITS OVER 2,000 CFM.
9. PROVIDE WITH FACTORY INSTALLED ECM DIRECT DRIVE MOTOR.
10. PROVIDE WITH FACTORY INSTALLED NON FUSED DISCONNECT.
11. PROVIDE WITH FACTORY INSTALLED CONTROLLER WITH BACNET INTERFACE.
12. PROVIDE FACTCORY INSTALLED EXTERIOR AND INTERIOR CORROSION COATING CAPABLE OF WITHSTANDING 2,500 HRS SALT SPRAY PER ASTM B-117-95.
13. PROVIDE WITH AUXILARY DRAIN PAN.
14. PROVIDE AND INSTALL REFRIGERANT LINES PER MANUFACTURER RECOMMENDATIONS.

FANCOIL SCHEDULE

AIR HANDLING UNIT DESIGNATION	FCU-1	FCU-2
INDOOR UNIT TYPE	WALL	WALL
SUPPLY CFM	583	583
TOTAL COOLING CAPACITY (MBH)	18.0	18.0
HEATING CAPACITY (MBH)	21.6	21.6
ENTERING AIR (DB/WB)°F	80/67	80/67
VOLTAGE/PHASE	208/1ø	208/1ø
MCA/MOCP	N/A	N/A
MANUFACTURER	DAIKIN	DAIKIN
MODEL	FTXS18LVJU	FTXS18LVJU
UNIT WEIGHT (LBS)	31	31
CONDENSING UNIT DESIGNATION	FCCU-1	FCCU-2
CONDENSER AIR (CLG'F/HTG'F)	95/47	95/47
REFRIGERANT	R-410A	R-410A
COOLING OPER. RANGE	14'F - 115'F	14'F - 115'F
HEATING OPER. RANGE	5'F - 64'F	5'F - 64'F
VOLTAGE/PHASE	208/1ø	208/1ø
MCA/MOCP	13.7/20	13.7/20
MANUFACTURER	DAIKIN	DAIKIN
MODEL	RXS18LVJU	RXS18LVJU
UNIT WEIGHT (LBS)	104	104
REMARKS	1,2,3,4,5,6,7	1,2,3,4,5,6,7

REMARKS
1. PROVIDE WITH WALL MOUNTED THERMOSTAT.
2. PROVIDE INDOOR UNIT WITH WALL BRACKET.
3. PROVIDE AND INSTALL REFRIGERANT LINES PER MANUFACTURER RECOMMENDATIONS.
4. PROVIDE WITH ROOF CURB FOR CONDENSER UNIT MOUNTING.
5. SIGHT GLASSES, FILTER DRYERS, AND FIELD SUPPLIED EXPANSION VALVES ARE NOT TO BE USED ON DAIKIN EQUIPMENT
6. PROVIDE CONDENSER COIL CORROSION PROTECTION.
7. PROVIDE SINGLE CIRCUIT POWER FROM SERVICE TO CONDENSING UNIT AND WIRE TO FANCOIL.

DEHUMIDIFICATION AIR HANDLING UNIT SCHEDULE

AIR HANDLING UNIT DESIGNATION	PAHU-1	PAHU-2	PAHU-3
UNIT CONFIGURATION	HORIZONTAL	HORIZONTAL	HORIZONTAL
UNIT LOCATION	INDOOR	INDOOR	INDOOR
SPACE SERVED	COMPETITION POOL	COMPETITION POOL	DIVE POOL
OCCUPIED SPACE CONDITION (°F DB/%RH)	84°F/60%	84°F/60%	84°F/60%
UNOCCUPIED SPACE CONDITION (°F DB/%RH)	84°F/55%	84°F/55%	84°F/55%
OUTSIDE AIR (CFM)	3375	3375	3050
EXHAUST AIR (CFM)	3712	3712	3355
OUTSIDE AIR SWIM MEET (CFM)	7215	7215	3050
EXHAUST AIR SWIM MEET (CFM)	8250	8250	3355
SUPPLY FAN SECTION			
CFM	64,000	64,000	64,000
EXTERNAL S.P. ("W.G.)	2.0	2.0	2.0
MOTOR HP.	4 @ 25	4 @ 25	4 @ 25
FAN TYPE	PLENUM DD/TEFC MOTOR	PLENUM DD/TEFC MOTOR	PLENUM DD/TEFC MOTOR
EXHAUST FAN SECTION			
CFM	3,712	3,712	3,355
EXTERNAL S.P. ("W.G.)	0.75	0.75	0.75
MOTOR HP.	2 @ 2.4	2 @ 2.4	2 @ 2.4
FAN TYPE	PLENUM DD/EC MOTOR	PLENUM DD/EC MOTOR	PLENUM DD/EC MOTOR
PURGE FAN SECTION			
CFM	62,150	62,150	58,245
EXTERNAL S.P. ("W.G.)	0.75	0.75	0.75
MOTOR HP.	6 @ 5.3	6 @ 5.3	5 @ 5.3
FAN TYPE	AXIAL DD/EC MOTOR	AXIAL DD/EC MOTOR	AXIAL DD/EC MOTOR
COOLING COIL SECTION			
COIL TYPE	DIRECT EXPANSION	DIRECT EXPANSION	DIRECT EXPANSION
TOTAL CAPACITY (MBH)	1,051.3	1,051.3	522.3
SENSIBLE CAPACITY (MBH)	530.7	530.7	263.7
MOISTURE REMOVAL (LB/HR)	482	482	239.5
NUMBER OF CIRCUITS	2	2	2
MAX LATENT CAPACITY (LBS/HR)	503.9	503.9	503.9
REHEAT COIL SECTION			
TOTAL HEAT REJECTION (MBH)	1,314.1	1,314.1	652.9
CONTROL TYPE	FULL MODULATING	FULL MODULATING	FULL MODULATING
POOL WATER HEATING SECTION			
TOTAL CAPACITY (MBH)	780	780	390
WATER FLOW (GPM)/PRESSURE DROP (PSI)	120/8	120/8	70/5
COMPRESSOR SECTION			
COMPRESSOR TYPE/REFRIGERANT TYPE	SCROLL/R410A	SCROLL/R410A	SCROLL/R410A
NUMBER OF COMPRESSORS	2	2	2
FLUID COOLED FLOW (GPM)	180	180	100
PUMP HP./PRESSURE DROP (PSI)	2.1/6.7	2.1/6.7	1.8/2.4
HEATING COIL SECTION			
COIL TYPE	GAS	GAS	GAS
TOTAL INPUT CAPACITY (MBH)	1,600	1,600	1,200
TOTAL OUTPUT CAPACITY (MBH)	1,280	1,280	960
CONTROL	MODULATING	MODULATING	MODULATING
TEMPERATURE RISE (°F)	--	--	--
ELECTRICAL			
VOLTAGE/PHASE	460/3ø	460/3ø	460/3ø
FLA	252.3	252.3	162.3
MCA/MOCP	269/300	269/300	171/200
OVERALL UNIT			
MANUFACTURER	SERESCO	SERESCO	SERESCO
MODEL	NP-080-PT-I-A4FT1643G2E5ADE	NP-080-PT-I-A4FT1643G2E5ADE	NP-040-PL-I-A4FT2563G2E5ADE
NOMINAL TONNAGE	80	80	40
UNIT WEIGHT (LBS)	19,100	19,100	19,100
REMARKS	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7,8

REMARKS
1. PROVIDE 2-INCH DOUBLE WALL CONSTRUCTION.
2. PROVIDE ONE FACTORY INSTALLED VFD FOR ONE SUPPLY FOR AIR BALANCE PURPOSES.
3. PROVIDE FACTORY INSTALLED CONTROLLER WITH WEB ACCESS AND BACNET IP INTERFACE.
4. PROVIDE FACTORY WIRED LIGHTS WITHIN THE UNIT SECTIONS AS SPECIFIED. LIGHTS TO BE CONTROLLED BY A SINGLE SWITCH. POWER TO CIRCUIT TO BE FIELD WIRED.
5. PROVIDE UNIT MOUNTED GFCI 120 VOLT SERVICE RECEPTACLE. POWER TO BE FIELD WIRED.
6. PROVIDE UNIT MOUNTED DISCONNECT AND SINGLE POINT POWER CONNECTION.
7. SEE SPECIFICATION FOR CONSTRUCTION AND OTHER REQUIREMENTS.
8. HEATING COIL SECTION SHALL BE OF DIRECT VENT CONFIGURATION.

SINGLE DUCT BOX SCHEDULE "RTU-A"

DESIGNATION	SERVING	INLET SIZE (INCHES)	AIRFLOW CFM (MAX/MIN)	OUTLET SIZE (INCHES)	ELECTRIC HEAT COIL DATA				MANUFACTURER	MODEL
					MIN KW	EAT/LAT	VOLTAGE	CFM		
SDB-1A	RTU-A	10"ø	950/475	14 X 12	4.5	70/95	480/3ø	475	PRICE	SDV
SDB-2A	RTU-A	10"ø	800/400	14 X 12	4.0	70/95	480/3ø	400	PRICE	SDV
SDB-3A	RTU-A	10"ø	1125/575	14 X 12	5.5	70/95	480/3ø	575	PRICE	SDV
SDB-4A	RTU-A	10"ø	925/450	14 X 12	4.5	70/95	480/3ø	450	PRICE	SDV
SDB-5A	RTU-A	8"ø	600/300	12 X 10	3.0	70/95	480/3ø	300	PRICE	SDV
SDB-6A	RTU-A	10"ø	1075/500	14 X 12	5.0	70/95	480/3ø	500	PRICE	SDV
SDB-7A	RTU-A	6"ø	400/250	12 X 10	2.5	70/95	480/3ø	250	PRICE	SDV
SDB-8A	RTU-A	8"ø	550/275	12 X 10	2.5	70/95	480/3ø	275	PRICE	SDV

NOTES:
1. UNITS ARE BASED ON 0.5" INLET STATIC PRESSURE.
2. UNIT CONTROLLERS SHALL BE PROVIDED BY CONTROLS CONTRACTOR AND FACTORY MOUNTED BY BOX MANUFACTURER.
3. UNIT VOLTAGE SHALL BE 480/3ø (4 WIRE).
4. UNIT SHALL BE PROVIDED WITH DDC CONTROLS TRANSFORMER.
5. VERIFY CONTROL BOX LOCATION (RIGHT/LEFT) WITH PLANS.
6. UNIT SHALL BE PROVIDED WITH MOUNTING BRACKETS.
7. PROVIDE WITH SCR CONTROLLED ELECTRIC HEATERS.
8. PROVIDE WITH DOOR INTERLOCK DISCONNECT SWITCH.

SINGLE DUCT BOX SCHEDULE "RTU-B"

DESIGNATION	SERVING	INLET SIZE (INCHES)	AIRFLOW CFM (MAX/MIN)	OUTLET SIZE (INCHES)	ELECTRIC HEAT COIL DATA				MANUFACTURER	MODEL
					MIN KW	EAT/LAT	VOLTAGE	CFM		
SDB-1B	RTU-B	8"ø	550/275	12 X 10	2.5	70/95	480/3ø	275	PRICE	SDV
SDB-2B	RTU-B	12"ø	1300/650	16 X 15	6.5	70/95	480/3ø	650	PRICE	SDV
SDB-3B	RTU-B	6"ø	375/250	12 X 10	2.5	70/95	480/3ø	250	PRICE	SDV
SDB-4B	RTU-B	10"ø	1050/500	14 X 12	5.0	70/95	480/3ø	500	PRICE	SDV
SDB-5B	RTU-B	8ø	600/300	12 X 8	3.0	70/95	480/3ø	300	PRICE	SDV
SDB-6B	RTU-B	10"ø	900/450	14 X 12	4.5	70/95	480/3ø	450	PRICE	SDV
SDB-7B	RTU-B	10"ø	950/475	14 X 12	4.5	70/95	480/3ø	475	PRICE	SDV

NOTES:
1. UNITS ARE BASED ON 0.5" INLET STATIC PRESSURE.
2. UNIT CONTROLLERS SHALL BE PROVIDED BY CONTROLS CONTRACTOR AND FACTORY MOUNTED BY BOX MANUFACTURER.
3. UNIT VOLTAGE SHALL BE 480/3ø (4 WIRE).
4. UNIT SHALL BE PROVIDED WITH DDC CONTROLS TRANSFORMER.
5. VERIFY CONTROL BOX LOCATION (RIGHT/LEFT) WITH PLANS.
6. UNIT SHALL BE PROVIDED WITH MOUNTING BRACKETS.
7. PROVIDE WITH SCR CONTROLLED ELECTRIC HEATERS.
8. PROVIDE WITH DOOR INTERLOCK DISCONNECT SWITCH.

SINGLE DUCT BOX SCHEDULE "RTU-C"

DESIGNATION	SERVING	INLET SIZE (INCHES)	AIRFLOW CFM (MAX/MIN)	OUTLET SIZE (INCHES)	ELECTRIC HEAT COIL DATA				MANUFACTURER	MODEL
					MIN KW	EAT/LAT	VOLTAGE	CFM		
SDB-1C	RTU-C	8"ø	500/250	12 X 10	2.5	70/95	480/3ø	250	PRICE	SDV
SDB-2C	RTU-C	12"ø	1350/675	16 X 15	6.5	70/95	480/3ø	675	PRICE	SDV
SDB-3C	RTU-C	10"ø	1200/600	14 X 12	6.0	70/95	480/3ø	600	PRICE	SDV
SDB-4C	RTU-C	8"ø	700/350	12 X 10	3.5	70/95	480/3ø	350	PRICE	SDV
SDB-5C	RTU-C	8"ø	575/275	12 X 10	2.5	70/95	480/3ø	275	PRICE	SDV
SDB-6C	RTU-C	8"ø	750/375	12 X 10	3.5	70/95	480/3ø	375	PRICE	SDV
SDB-7C	RTU-C	10"ø	1100/550	14 X 12	5.5	70/95	480/3ø	550	PRICE	SDV
SDB-8C	RTU-C	6"ø	350/250	12 X 10	2.5	70/95	480/3ø	250	PRICE	SDV
SDB-9C	RTU-C	8"ø	600/300	12 X 10	3.0	70/95	480/3ø	300	PRICE	SDV

NOTES:
1. UNITS ARE BASED ON 0.5" INLET STATIC PRESSURE.
2. UNIT CONTROLLERS SHALL BE PROVIDED BY CONTROLS CONTRACTOR AND FACTORY MOUNTED BY BOX MANUFACTURER.
3. UNIT VOLTAGE SHALL BE 480/3ø (4 WIRE).
4. UNIT SHALL BE PROVIDED WITH DDC CONTROLS TRANSFORMER.
5. VERIFY CONTROL BOX LOCATION (RIGHT/LEFT) WITH PLANS.
6. UNIT SHALL BE PROVIDED WITH MOUNTING BRACKETS.
7. PROVIDE WITH SCR CONTROLLED ELECTRIC HEATERS.
8. PROVIDE WITH DOOR INTERLOCK DISCONNECT SWITCH.

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

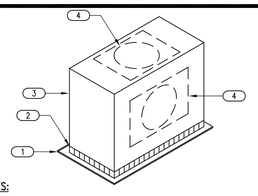
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

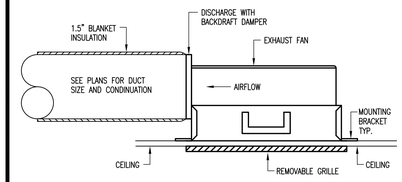
M2.02
MECHANICAL SCHEDULES



KEY NOTES:

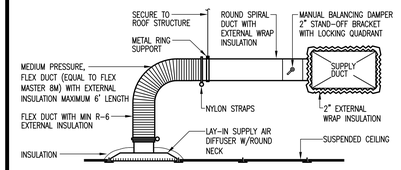
1. CEILING MOUNTED RETURN/EXHAUST AIR GRILLE. SEE PLANS AND SCHEDULE.
2. SECURE INTERNALLY LINED PLENUM TO AIR DEVICE.
3. PLENUM HEIGHT SHALL BE 12-INCHES MINIMUM WITH 1.5" INTERNAL LINING.
4. PROVIDE ROUND/SQUARE TAP CONNECTION AS REQUIRED.

A RETURN/EXHAUST AIR DEVICE PLENUM
SCALE: NTS

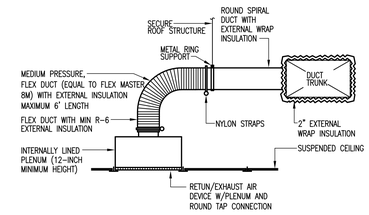


NOTE: INSTALL PER MANUFACTURER RECOMMENDATIONS

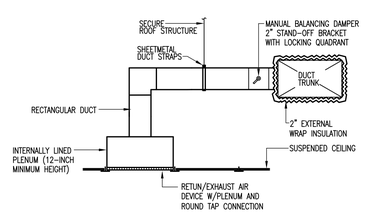
B CEILING MOUNTED EXHAUST FAN
NO SCALE



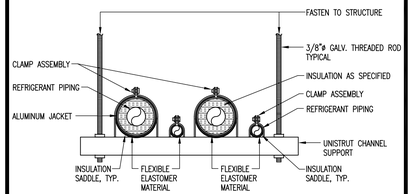
C SUPPLY AIR DIFFUSER
SCALE: N.T.S.



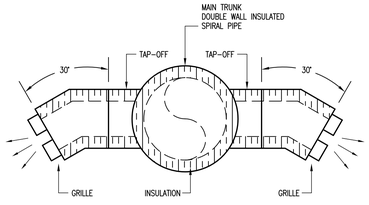
D RETURN/EXHAUST AIR DEVICE
SCALE: N.T.S.



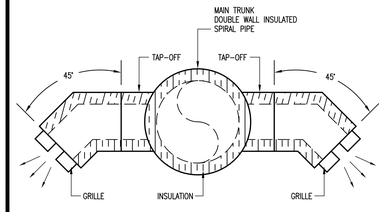
E RETURN/EXHAUST AIR DEVICE
SCALE: N.T.S.



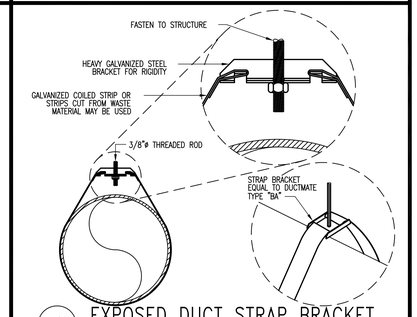
F INTERIOR REFRIGERANT PIPING SUPPORT
SCALE: NTS



G EXPOSED SUPPLY TRUNK DETAIL
SCALE: NTS



H EXPOSED SUPPLY TRUNK DETAIL
SCALE: NTS



J EXPOSED DUCT STRAP BRACKET
SCALE: NTS

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

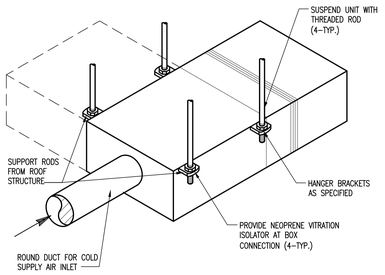
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

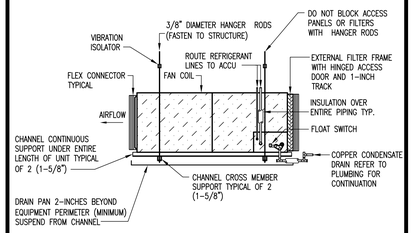
MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT	971805
DATE	06/07/2019
REVISED	

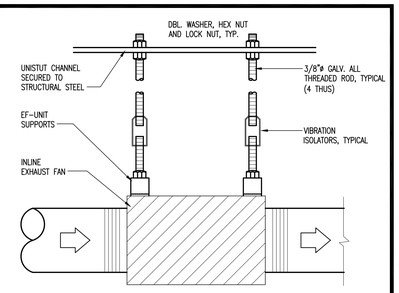
M3.01
MECHANICAL DETAILS



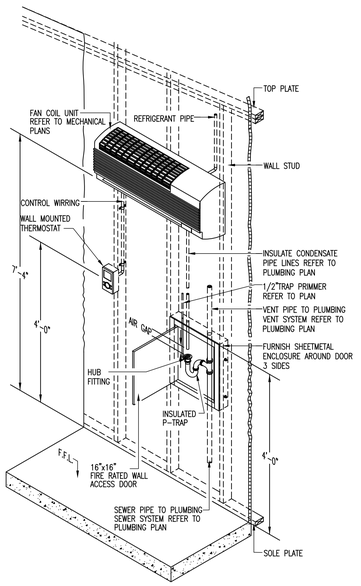
A TYP. VAV TERMINAL UNIT
SCALE: NTS



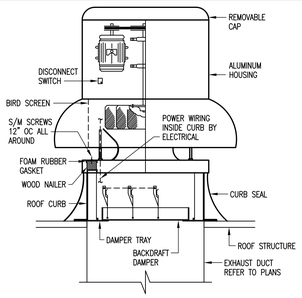
B AIR HANDLING UNIT DETAIL
SCALE: N.T.S. HORIZONTAL/SUSPENDED



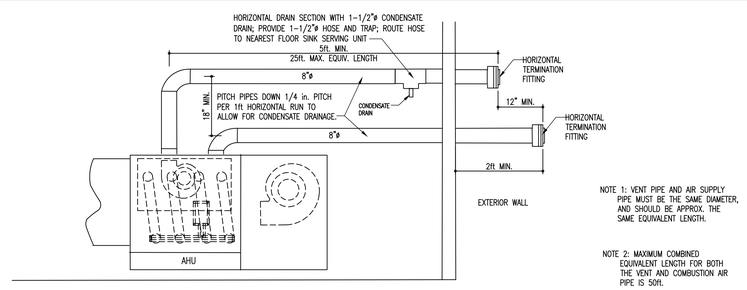
C INLINE EXHAUST FAN DETAIL
SCALE: NTS



E FAN COIL INSTALLATION DETAIL
SCALE: N.T.S.



D ROOF MOUNTED EXHAUST FAN
SCALE: NTS



F POOL AHU FURNACE DIRECT VENT DETAIL
SCALE: N.T.S.

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

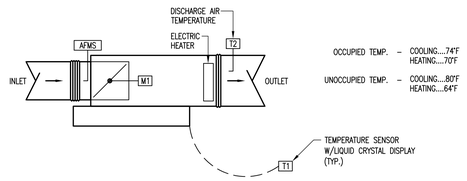
PROJECT 971805
DATE 06/07/2019
REVISED

M3.02
MECHANICAL DETAILS

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

CONTROL DRAWING SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
AFMS	AIRFLOW MONITORING STATION	M	MOTORIZED 3-WAY VALVE
CO2	CARBON DIOXIDE SENSOR	RH	RELATIVE HUMIDITY SENSOR
CSR	CURRENT SENSING RELAY	SD	SMOKE DETECTOR
DSPS	DUCT STATIC PRESSURE SENSOR	T1 .. TX	TEMPERATURE SENSOR
M1 .. MX	MOTORIZED ACTUATOR	VFD	VARIABLE FREQUENCY DRIVE
M	MOTORIZED 2-WAY VALVE		AIRFLOW DIRECTION

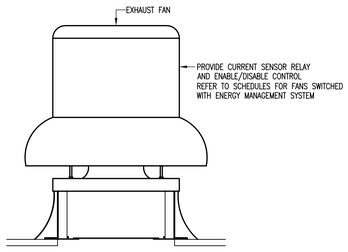


A SINGLE DUCT BOX CONTROL DIAGRAM

SCALE: N.T.S. TYPICAL OF ALL SINGLE DUCT BOXES

START/STOP CONTROL – THE EMS (ENERGY MANAGEMENT SYSTEM) SHALL INITIATE START/STOP CONTROL OF THE SYSTEM BY PROGRAMMED SCHEDULE, TIMED OVERRIDE, OR OPERATOR OVERRIDE.

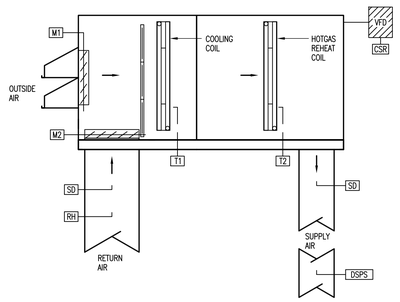
TEMPERATURE CONTROL – THE SPACE TEMPERATURE SENSOR "T1" SHALL CONTROL ROOM TEMPERATURE AND SHALL BE LOCALLY ADJUSTABLE FOR (+/–) 2°F FROM PROGRAMMED SETPOINT. TEMPERATURE SENSOR SHALL HAVE AFTER HOURS OVERRIDE TO ENABLE COOLING/HEATING SYSTEM. THE SPACE TEMPERATURE SENSOR "T1" SHALL MONITOR ROOM AIR TEMPERATURE TO DETERMINE REQUIRED CONDITIONING OF AIR. WHEN HEATING IS REQUIRED, THE ELECTRIC HEATER SHALL BE ENABLED TO MAINTAIN PROGRAMMED TEMPERATURE. WHEN COOLING IS REQUIRED, THE TERMINAL UNIT DAMPER "M1" SHALL MODULATE TO MAINTAIN THE REQUIRED SPACE TEMPERATURE. DURING HUMIDITY CONTROL, TERMINAL UNIT DAMPER "M1" SHALL MODULATE TO SCHEDULED CFM AND ELECTRIC HEATER SHALL BE ENABLED TO MAINTAIN PROGRAMMED TEMPERATURE.



START/STOP CONTROL – THE EMS (ENERGY MANAGEMENT SYSTEM) SHALL INITIATE START/STOP CONTROL OF THE SYSTEM BY PROGRAMMED SCHEDULE, TIMED OVERRIDE, OR OPERATOR OVERRIDE.

C EXHAUST FAN CONTROL DIAGRAM

SCALE: N.T.S.



B AIR HANDLING UNIT CONTROL DIAGRAM

SCALE: NTS TYPICAL OF: RTU'S

START/STOP CONTROL – THE EMS (ENERGY MANAGEMENT SYSTEM) SHALL INITIATE START/STOP CONTROL OF THE SYSTEM BY PROGRAMMED SCHEDULE, TIMED OVERRIDE, OR OPERATOR OVERRIDE.

FAN CONTROL – THE EMS SHALL MONITOR THE FAN STATUS VIA A BACNET INTERFACE PROVIDED WITH THE RTU. ONCE THE EMS RECEIVES THE ON STATUS FOR THE SUPPLY FAN, THE DUCT STATIC PRESSURE SENSOR SHALL SIGNAL THE VFD TO INCREASE OR DECREASE FAN SPEED AS REQUIRED TO MAINTAIN PREDETERMINED STATIC PRESSURE SET POINT. VFD SHALL STARTUP AT 50% DESIGN AIR FLOW (MINIMUM FAN SPEED SETPOINT).

TEMPERATURE CONTROL – THE COOLING COIL TEMPERATURE SENSOR "T1" SHALL STAGE THE COMPRESSORS AS REQUIRED TO MAINTAIN 55°F LEAVING AIR TEMPERATURE. THE EMS SHALL POLL THE AVERAGE OUTPUT (%) OF BOXES BEING SERVED AND INCREASE/DECREASE THE HOTGAS REHEAT TEMPERATURE "T2" AS REQUIRED TO MAINTAIN 65%–75% AVERAGE OUTPUT.

HUMIDITY CONTROL – HUMIDITY CONTROL SHALL COMMENCE UPON DETECTION OF 60% RETURN AIR RELATIVE HUMIDITY. THE HUMIDITY CONTROL SEQUENCE SHALL OVERRIDE SUPPLY AIR TEMPERATURE SETPOINT TO 52°F. UNDER THESE CONDITIONS, THE HOTGAS REHEAT COIL SHALL BE USED TO MAINTAIN AVERAGE SPACE TEMPERATURE SETPOINT. HUMIDITY CONTROL SHALL CONTINUE UNTIL RETURN AIR RELATIVE HUMIDITY IS 50%.

ECONOMIZER MODE – ECONOMIZER MODE SHALL START/STOP UPON DETECTION OF 55°F (ADJ.) OUTSIDE AIR TEMPERATURE OR LOWER, AND DIFFERENTIAL ENTHALPY SENSOR VALIDATION.

UNOCCUPIED CONTROL – DURING UNOCCUPIED PERIOD, OUTSIDE AIR DAMPER SHALL BE IN CLOSED POSITION AND RETURN AIR DAMPER SHALL BE FULLY OPEN. THE EMS SHALL POLL THE AVERAGE TEMPERATURE/HUMIDITY OF ALL SENSORS AND CYCLE UNIT ON/OFF AS REQUIRED TO MAINTAIN SETPOINT.

THE CONTROLS CONTRACTOR SHALL MAKE AVAILABLE ALL VARIABLES/PARAMETERS INVOLVED IN THE CONTROL SEQUENCE(S) THRU THE FRONT END GRAPHICS. READ/WRITE CAPABILITIES SHALL BE AS ALLOWED BY THE UNITS CONTROLLER. THESE ARE TO INCLUDE (BUT NOT LIMITED TO): UNIT APPLICATION MENU, COOLING CAPACITY (%), SUPPLY FAN CAPACITY (%), COOLING COIL SUPPLY AIR TEMP. (°F), HGRG COIL SUPPLY AIR TEMP. (°F), RETURN AIR TEMP. (°F), OUTDOOR AIR TEMP. (°F), RELATIVE HUMIDITY (%), AND REHEAT CAPACITY (%).

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

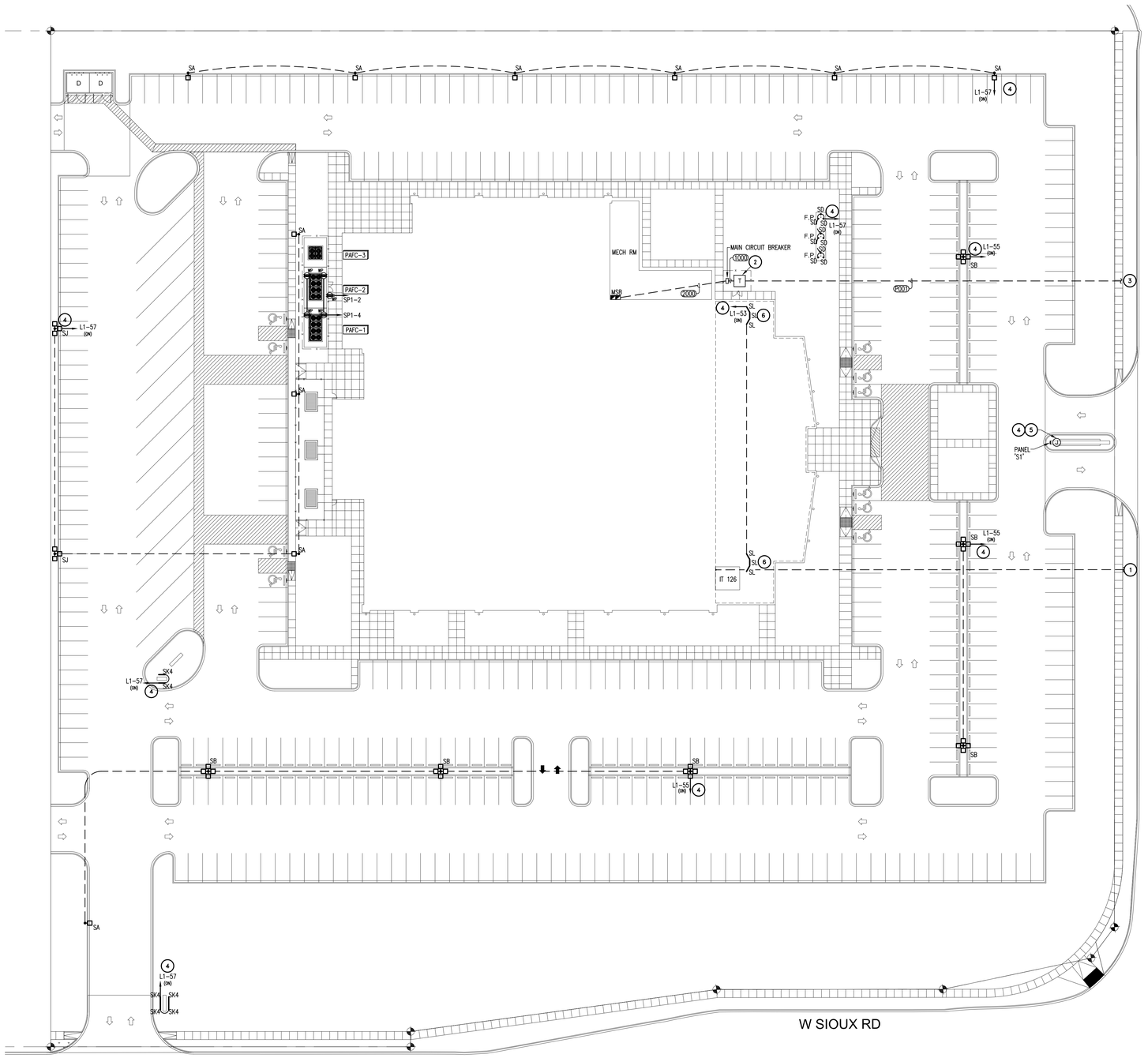
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

M3.03

MECHANICAL
CONTROLS DETAILS

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A ELECTRICAL SITE PLAN
SCALE: 1" = 30'-0"

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPTANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) FOR ELECTRICAL FEEDER/BRANCH SCHEDULE. REFER TO SHEET E2.01.

KEYED NOTES:⬡

1. FURNISH AND INSTALL 2-4"C FOR ROUTING OF TELEPHONE/CABLE. ROUTE AS DIRECTED BY TELEPHONE/CABLE COMPANY.
2. TRANSFORMER PAD FOR UTILITY COMPANY TRANSFORMER.
3. ROUTE AS DIRECTED BY UTILITY COMPANY.
4. LIGHTING CIRCUIT SHALL BE CONTROLLED VIA THE LIGHTING CONTROLLER WITH A 7-DAY, 24 HOUR, PROGRAMMABLE, ASTRONOMICAL TIME CLOCK AND BY-PASS PHOTOCELL. PHOTOCELL MOUNTED ON BUILDING EXTERIOR ON NORTH WALL FACING EXPOSURE. ROUTE 2#10, #10G, 3/4".
5. FURNISH AND INSTALL WEATHERPROOF J-BOX FOR CONNECTION OF SIGN. ROUTE TO MECHANICAL ROOM ADJACENT TO PANEL L1.
6. FIXTURES SHALL BE MOUNTED ON ROOF, AIMED TO BUILDING SIGNAGE.

FIELD VERIFY ALL CONDITIONS

DESIGN DRAWINGS SCHEMATIC. THIS CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING OR AWARD OF CONTRACT TO INSPECT EXISTING FEILD CONDITIONS. THIS CONTRACT SHALL INCLUDE ALL LABOR AND MATERIALS NECCESSARY FOR FEILD MODIFICATIONS DUE TO EXISTING CONDITIONS.

THE CONTRACTOR SHALL CONTACT THE ARCHITECT, ENGINEER OR OWNER PRIOR TO BIDDING FOR INTERPRETATIONS AND CLARIFICATIONS OF THE DESIGN AND INCLUDE IN HIS BID ALL COSTS TO MEET THE DESIGN INTENT. CLARIFICATIONS MADE BY THE ARCHITECT, ENGINEER OR OWNER AFTER BIDDING WILL BE FINAL AND SHALL BE IMPLEMENTED AT CONTRACTORS COST.

BIDDING CONTRACTORS SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES AND SHALL INCLUDE IN THEIR BIDS THE COSTS FOR ALL WORK INSTALLED IN STRICT ACCORDANCE WITH GOVERNING CODES, THE PLANS AND SPECIFICATIONS NOT WITHSTANDING. THE CONTRACTOR SHALL ALERT ARCHITECT, ENGINEER OR OWNER OF ANY APPARENT DISCREPANCIES BETWEEN GOVERNING CODES AND DESIGN INTENT.

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

E1.00
ELECTRICAL SITE PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

GENERAL NOTES:

A. LIGHT FIXTURES SHALL BE CIRCUITED TO CIRCUIT INDICATED IN SPACE.

B. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN (RCP) FOR EXACT LOCATION OF LIGHT FIXTURES. FURNISH FIXTURES WITH TRIM COMPATIBLE WITH THE TYPE OF CEILING AS INDICATED ON THE RCP.

C. EXIT LIGHTS ARE TYPE X, UNO. CONNECT EXIT LIGHT FIXTURES TO UN-SWITCHED CIRCUIT SERVING SPACE IN WHICH FIXTURE IS INSTALLED. INSTALL WALL MOUNTED FIXTURES 8'-0" AFF, UNO.

D. COORDINATE PLACEMENT OF FIXTURES WITH ACTUAL INSTALLATION OF MECHANICAL EQUIPMENT AND DUCTWORK.

E. CIRCUIT EMERGENCY FIXTURES IN ROOMS TO PERMIT ALL THE LAMPS TO BE SWITCHED OFF, LEAVING THE BATTERY IN STAND BY CONDITION, SO THE EMERGENCY BATTERY UNIT WILL OPERATE ONE LAMP WHEN THE NORMAL POWER IS INTERRUPTED. REQUEST THE REQUIRED WIRING DIAGRAM FROM EQUIPMENT MANUFACTURER. ALL EMERGENCY LIGHTING FIXTURES SHALL BE CIRCUITED TO THE NON-SWITCHED PHASE WIRE IN ADDITION TO THE SWITCHED LEG. ALL EXIT SIGNS SHALL BE CIRCUITED TO THE NON-SWITCHED PHASE WIRE ONLY.

F. SWITCH LEGS ARE NOT SHOWN WHERE SWITCHING SCHEME IS OBVIOUS.

G. FIXTURES SHALL BE CIRCUITED TO CIRCUIT INDICATED IN SPACE.

H. FOR MECHANICAL EQUIPMENT CONNECTION SCHEDULE. REFER TO DETAIL D/SHEET E2.01.

KEY NOTES:

1. EXHAUST FAN SHALL BE SWITCHED WITH LIGHTS, REFER TO SHEET E1.04 FOR LOCATION.
2. LIGHTING CIRCUIT SHALL BE CONTROLLED VIA THE LIGHTING CONTROLLER WITH A 7-DAY, 24 HOUR, PROGRAMMABLE, ASTRONOMICAL TIME CLOCK AND BY-PASS PHOTOCELL. PHOTOCELL MOUNTED ON BUILDING EXTERIOR ON NORTH WALL FACING EXPOSURE.
3. FURNISH AND INSTALL WEATHERPROOF J-BOX MOUNTED AT 18' AFF FOR CONNECTION OF SIGN. STUB IN 3/4"C FROM J-BOX INTO ATTIC SPACE. COORDINATE LOCATION WITH OWNER PRIOR TO ROUGH-IN.
4. ROUTE TO LUTRON QSN ENERGI SAVR NODE.
5. FOR FAN NETWORK CONTROL. COORDINATE EXACT LOCATION PRIOR TO ROUGH-IN.
6. POOL LIGHTING, COORDINATE LOCATION WITH POOL CONSULTANT DRAWINGS.

FIELD VERIFY ALL CONDITIONS

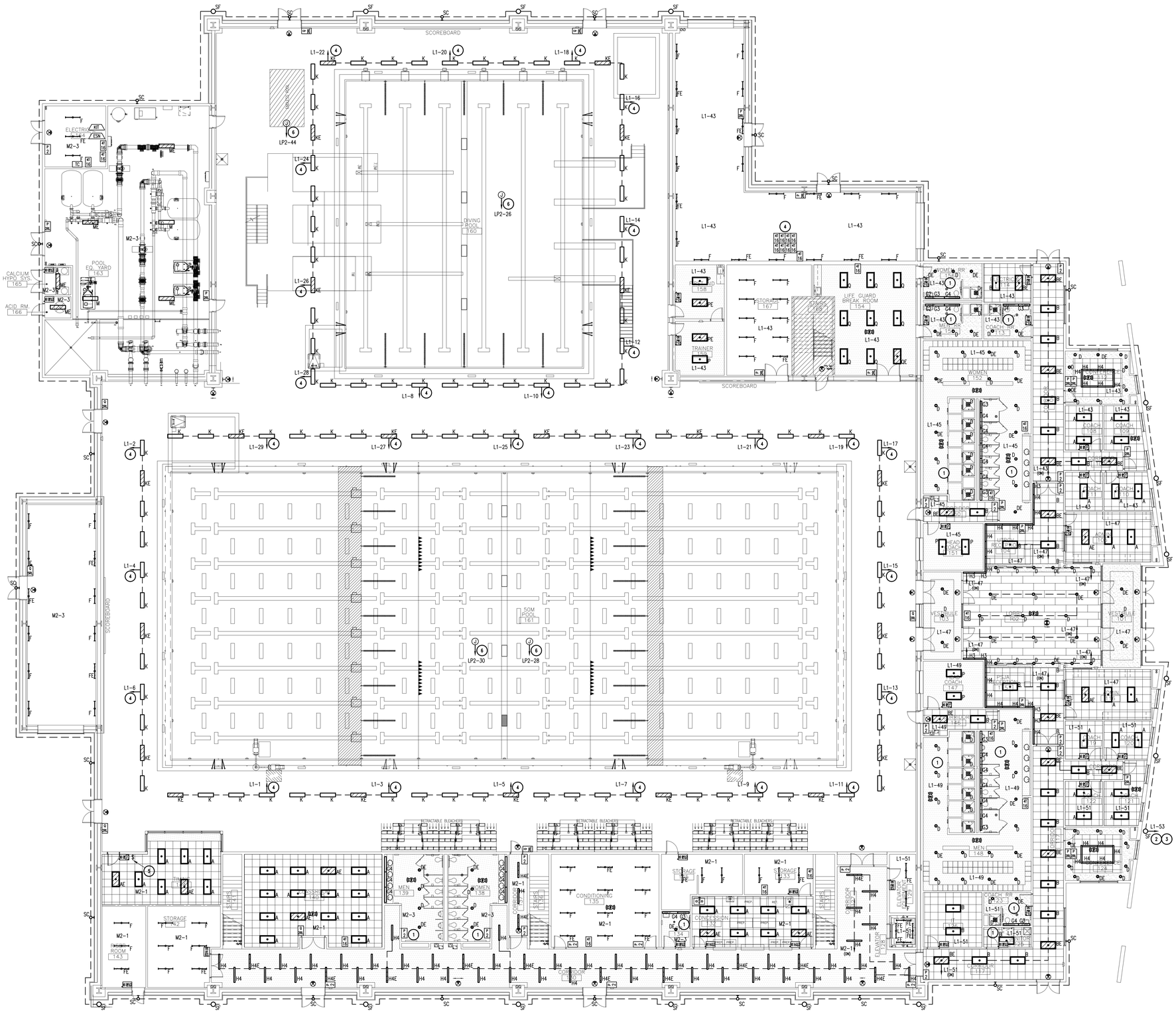
DESIGN DRAWINGS SCHEMATIC. THIS CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING OR AWARD OF CONTRACT TO INSPECT EXISTING FEILD CONDITIONS. THIS CONTRACT SHALL INCLUDE ALL LABOR AND MATERIALS NECCESSARY FOR FEILD MODIFICATIONS DUE TO EXISTING CONDITIONS.

THE CONTRACTOR SHALL CONTACT THE ARCHITECT, ENGINEER OR OWNER PRIOR TO BIDDING FOR INTERPRETATIONS AND CLARIFICATIONS OF THE DESIGN AND INCLUDE IN HIS BID ALL COSTS TO MEET THE DESIGN INTENT. CLARIFICATIONS MADE BY THE ARCHITECT, ENGINEER OR OWNER AFTER BIDDING WILL BE FINAL AND SHALL BE IMPLEMENTED AT CONTRACTORS COST.

BIDDING CONTRACTORS SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES AND SHALL INCLUDE IN THEIR BIDS THE COSTS FOR ALL WORK INSTALLED IN STRICT ACCORDANCE WITH GOVERNING CODES, THE PLANS AND SPECIFICATIONS NOT WITHSTANDING. THE CONTRACTOR SHALL ALERT ARCHITECT, ENGINEER OR OWNER OF ANY APPARENT DISCREPANCIES BETWEEN GOVERNING CODES AND DESIGN INTENT.

LEGEND(LUTRON)

QSN	QSN-4T16-S
MS	MS-B102-WH
MS-OPS6M	MS-OPS6M20V-WH
MS-Z	MS-Z101-WH
PX-2B	PX-2B-GWH-I01 (CW-1-WH)
PX-2BRL	PX-2BRL-GWH-I01 (CW-1-WH)
TC	QSGR-TC-3S-WH-CPN5825
QSWS2	QSWS2-2BRLI-WH
QSWS2-5B	QSWS2-5BRLIR-WH
LOS	LOS-CDT-2000-WH
ESN	QSE-CI-AP-D
KIT	C-ESN-SETUP



A ELECTRICAL LIGHTING FLOOR PLAN
SCALE: 3/32" = 1'-0"

THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

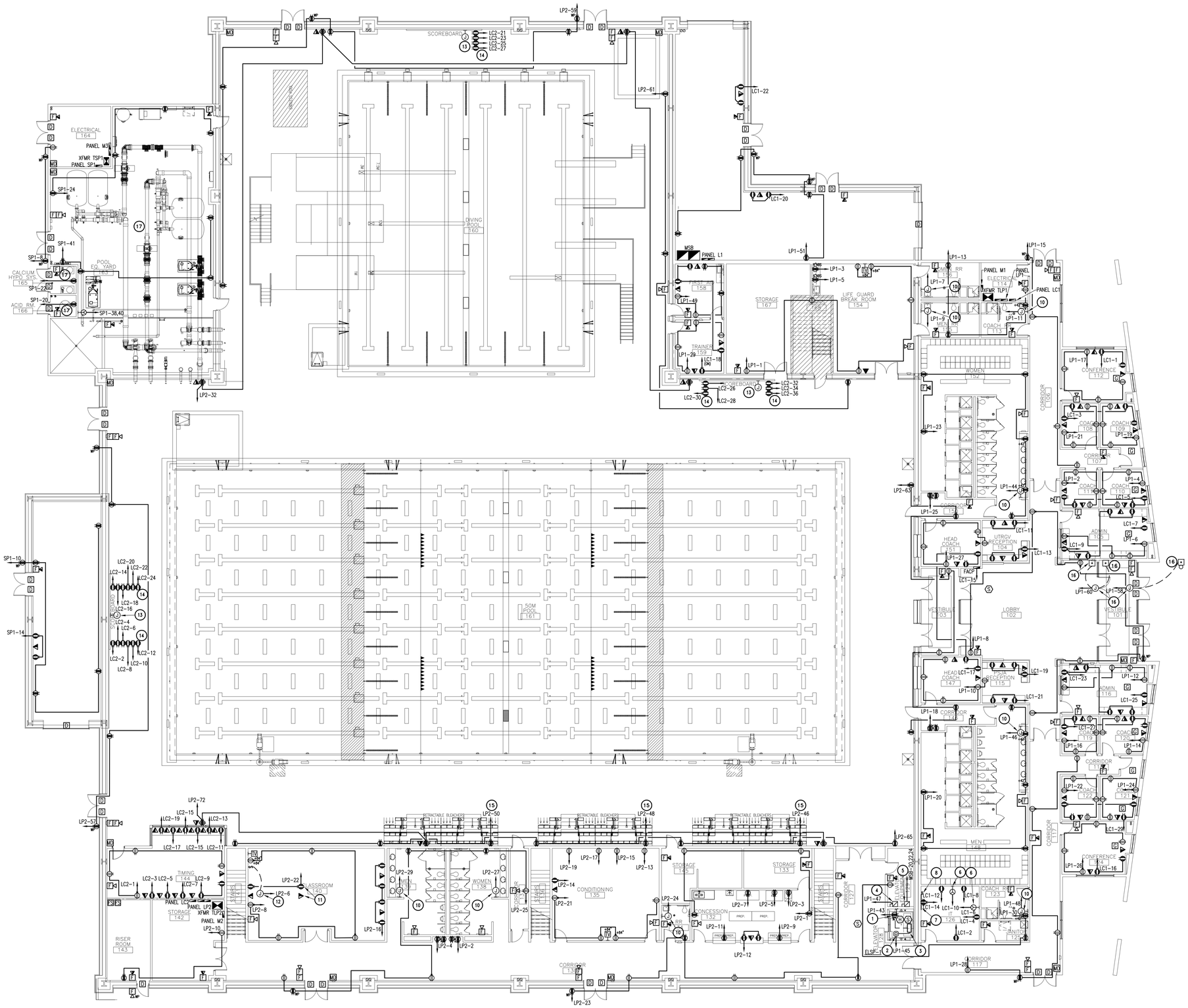
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT	971805
DATE	06/07/2019
REVISED	

E1.01

ELECTRICAL LIGHTING FLOOR PLAN



GENERAL NOTES:

A. COORDINATE ROUGH-IN LOCATION OF ALL DEVICES WITH ARCHITECTURAL ELEVATIONS, DETAILS, AND PLANS.

B. ALL DEVICES SHALL SHARE COMMON FACEPLATE WHERE APPLICABLE.

C. ALL ELECTRICAL COMPONENTS OF POOL TO BE BONDED PER NEC 680.

D. COORDINATE RECEPTACLES HEIGHT AND LOCATION WITH OWNER PRIOR TO ROUGH-IN.

E. ALL CIRCUITS SHALL BE LABEL PER NEC.

KEY NOTES:

1. TO LIGHTING PLAN. SEE DETAIL ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC SHEET E5.01.
2. FOR SUMP PUMP. SEE DETAIL ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC SHEET E5.01.
3. HIGH WATER LEVEL ALARM. SEE DETAIL ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC SHEET E5.01.
4. 30A, 2-POLE SWITCH WITH ONE 20A FUSE FOR ELEVATOR AUXILIARIES. COORDINATE EXACT LOCATION WITH ELEVATOR SUPPLIER PRIOR TO ROUGH-IN. SEE DETAIL ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC SHEET E5.01.
5. BUSSMAN #PS2T48R1AF1 POWER MODULE SWITCH WITH 150A FUSES FOR CONNECTION TO ELEVATOR CONTROLLER WITH 3#3/0, #6G, 2"C. COORDINATE EXACT LOCATION WITH ELEVATOR SUPPLIER PRIOR TO ROUGH-IN. BUSSMAN POWER MODULE SHALL BE FUSED AT ELEVATOR NAME PLATE RATING. SEE DETAIL ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC SHEET E5.01.
6. FURNISH AND INSTALL L5-30R RECEPTACLE. ROUTE 2#10, #10G, 1/2"C.
7. PROVIDE AND INSTALL 4' X 8' X 3/4" PLYWOOD BACKBOARD FOR MOUNTING OF COMMUNICATIONS EQUIPMENT. PROVIDE A FLOOR MOUNTED 3/4" X 4' GROUND BAR FOR TELEPHONE SERVICE. EXTEND #6 AWG FROM GROUND BAR TO MAIN GROUND BUS OF PANEL MSB.
8. FURNISH AND INSTALL 2-4"C FOR ROUTING OF TELEPHONE/CABLE.
9. FURNISH AND INSTALL J-BOX FOR CONNECTION OF OVERHEAD DOOR. ROUTE 2#12, 1/2"C.
10. FURNISH AND INSTALL J-BOX FOR CONNECTION OF HAND DRYER. COORDINATE EXACT LOCATION WITH ARCHITECTURAL DRAWINGS. ROUTE 2#10, #10G, 1/2"C.
11. FURNISH AND INSTALL RECEPTACLE AND SINGLE GANG BOX FOR CABLING. AT CEILING LOCATION FOR CONNECTION OF PROJECTOR. COORDINATE LOCATION WITH OWNER PRIOR TO ROUGH-IN.
12. FOR MOTORIZED PROJECTION SCREEN. COORDINATE EXACT LOCATION OF DEVICES WITH ARCHITECT PRIOR TO ROUGH-IN. ROUTE 3 WIRE CONTROL TO SWITCH FURNISHED WITH PROJECTION SCREEN. INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
13. FOR SCOREBOARD, ROUTE 1"C TO TIMING ROOM 144. ROUTE TO ABOVE ACCESSIBLE CEILING.
14. FURNISH AND INSTALL RECEPTACLES FOR SCOREBOARD, COORDINATE EXACT LOCATION WITH EQUIPMENT INSTALLER.
15. FURNISH AND INSTALL RECEPTACLES FOR RETRACTABLE BLEACHERS. COORDINATE EXACT LOCATION WITH EQUIPMENT INSTALLER.
16. FURNISH AND INSTALL J-BOX FOR CONNECTION OF POWERED DOORS. STUB IN 3/4"C FROM J-BOX INTO ATTIC SPACE. COORDINATE LOCATION WITH OWNER PRIOR TO ROUGH-IN.
17. ALL CONDUITS IS SPACE SHALL BE OF PVC TYPE.

FIELD VERIFY ALL CONDITIONS

DESIGN DRAWINGS SCHEMATIC. THIS CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING OR AWARD OF CONTRACT TO INSPECT EXISTING FIELD CONDITIONS. THIS CONTRACT SHALL INCLUDE ALL LABOR AND MATERIALS NECCESSARY FOR FEILD MODIFICATIONS DUE TO EXISTING CONDITIONS.

THE CONTRACTOR SHALL CONTACT THE ARCHITECT, ENGINEER OR OWNER PRIOR TO BIDDING FOR INTERPRETATIONS AND CLARIFICATIONS OF THE DESIGN AND INCLUDE IN HIS BID ALL COSTS TO MEET THE DESIGN INTENT. CLARIFICATIONS MADE BY THE ARCHITECT, ENGINEER OR OWNER AFTER BIDDING WILL BE FINAL AND SHALL BE IMPLEMENTED AT CONTRACTORS COST.

BIDDING CONTRACTORS SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES AND SHALL INCLUDE IN THEIR BIDS THE COSTS FOR ALL WORK INSTALLED IN STRICT ACCORDANCE WITH GOVERNING CODES, THE PLANS AND SPECIFICATIONS NOT WITHSTANDING. THE CONTRACTOR SHALL ALERT ARCHITECT, ENGINEER OR OWNER OF ANY APPARENT DISCREPANCIES BETWEEN GOVERNING CODES AND DESIGN INTENT.

NORTH

A ELECTRICAL POWER FLOOR PLAN
SCALE: 3/32" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED PROFESSIONAL ENGINEER
Abram L. Dominguez
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

E1.02

ELECTRICAL POWER FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

POOL EQUIPMENT SCHEDULES

Item No	Equipment Category	Qty	Volts	Phase	Circuit Designation	Wire Size	NOTE
	COMPETITION POOL						
PP1	RECIRCULATION PUMP	1	480	3	M3-7,9,11	3#3, 8G, 1-1/4"C	1
PP2	RECIRCULATION PUMP	1	480	3	M3-13,15,17	3#3, 8G, 1-1/4"C	1
1A	FILTER SYSTEM	1	120	1	SP1-5	2#12, 12G, 1/2"C	
1B	CHEMICAL CONTROLLER REFER:	1	120	1	SP1-7	2#12, 12G, 1/2"C	
1C	CHLORINATION SYSTEM REFER:	1	120	1	SP1-9	2#12, 12G, 1/2"C	2
1E	WATER LEVEL CONTROLLER REFER:	1	120	1	SP1-11	2#12, 12G, 1/2"C	
1K	UV TREATMENT SYSTEM & CONTROLLER REFER:	1	480	3	M3-44,46,48	2#12, 12G, 1/2"C	
1L	HEATER TEES REFER:	1	120	1	SP1-13	2#12, 12G, 1/2"C	
	DIVE POOL						
PP3	RECIRCULATION PUMP	1	480	3	M3-19,21,23	3#3, 8G, 1-1/4"C	1
PP4	RECIRCULATION PUMP	1	480	3	M3-25,27,29	3#3, 8G, 1-1/4"C	1
PP5	AGITATOR PUMP	1	240	1	SP1-1,3	2#10, 10G, 3/4"C	
2A	FILTER SYSTEM	1	120	1	SP1-15	2#12, 12G, 1/2"C	
2B	CHEMICAL CONTROLLER REFER:	1	120	1	SP1-17	2#12, 12G, 1/2"C	
2C	CHLORINATION SYSTEM REFER:	1	120	1	SP1-19	2#12, 12G, 1/2"C	2
2E	WATER LEVEL CONTROLLER REFER:	1	120	1	SP1-21	2#12, 12G, 1/2"C	
2K	UV TREATMENT SYSTEM & CONTROLLER REFER:	1	480	3	M3-50,52,54	2#12, 12G, 1/2"C	
2L	HEATER TEES REFER:	1	120	1	SP1-23	2#12, 12G, 1/2"C	
	ENDLESS POOL						
PP6	ENDLESS PUMP	1	240	1	SP1-33,35	2#10, 10G, 3/4"C	1
PP7	HYDROTHERAPY PUMP	1	240	1	SP1-37,39	2#10, 10G, 3/4"C	1
	FILTER SYSTEM	1	120	1	SP1-25	2#12, 12G, 1/2"C	
	CHEMICAL CONTROLLER REFER:	1	120	1	SP1-27	2#12, 12G, 1/2"C	2
	CHLORINATION SYSTEM REFER:	1	120	1	SP1-29	2#12, 12G, 1/2"C	
	WATER LEVEL CONTROLLER REFER:	1	120	1	SP1-31	2#12, 12G, 1/2"C	
	UV TREATMENT SYSTEM & CONTROLLER REFER:	1	240	1	SP1-30,32	2#12, 12G, 1/2"C	
	HEATER TEES REFER:	1	240	1	SP1-26,28	2#10, 10G, 3/4"C	
	SWIM CURRENT POWER UNIT	1	240	1	SP1-34,36	2#8, 10G, 3/4"C	

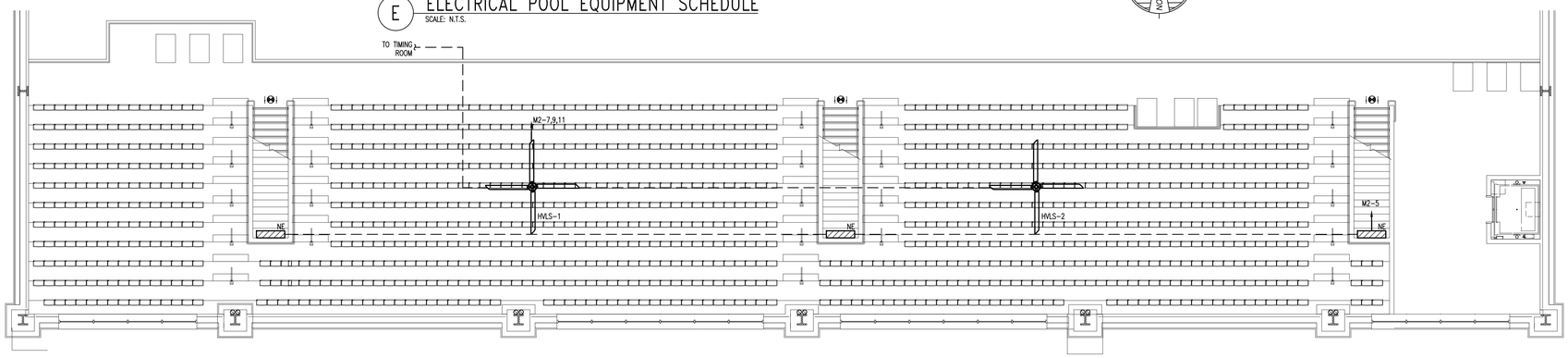
GEN NOTES:

1. COORDINATE LOCATION AND CONNECTION TYPE WITH EQUIPMENT INSTALLER.
2. INSTALL AUXILIARY IN RESPECTED PUMP VFD FOR REMOTE START STOP STATION.

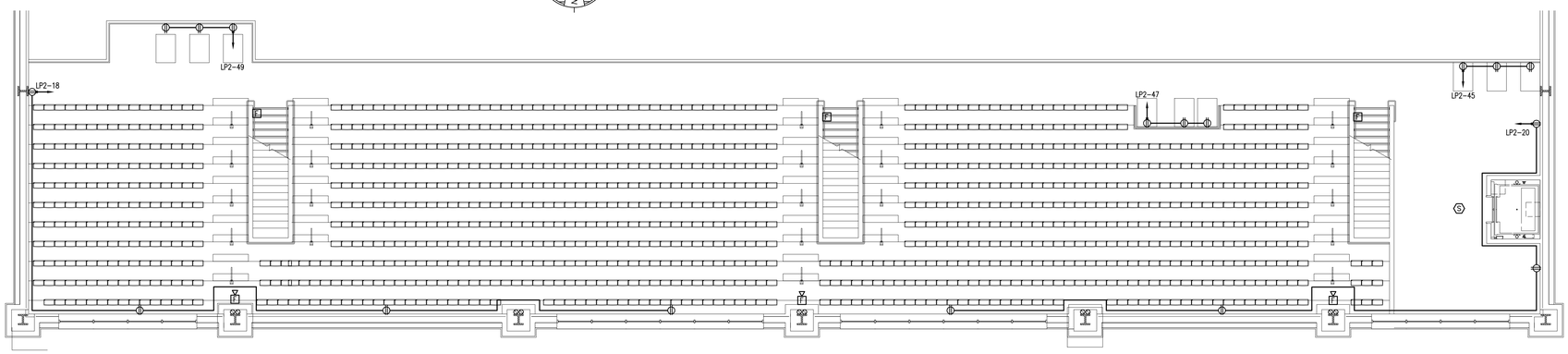
NOTES:

1. VFD FURNISHED BY SWIMMING POOL CONSULTANT AND INSTALLED BY ELECTRICAL CONTRACTOR. REFER TO POOL CONSULTANT DRAWINGS.
2. FURNISH AND INSTALL DATA CONNECTION. REFER TO POOL CONSULTANT DRAWINGS.

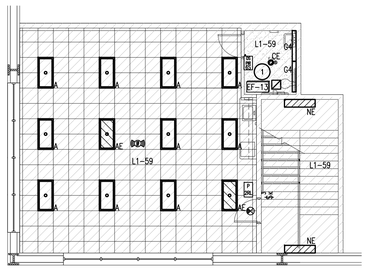
E ELECTRICAL POOL EQUIPMENT SCHEDULE
SCALE: N.T.S.



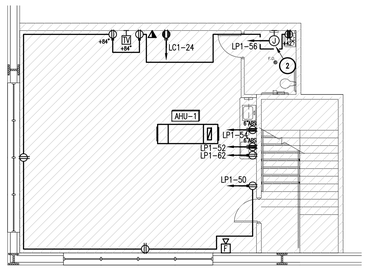
B ELECTRICAL LIGHTING FLOOR PLAN
SCALE: 1/8" = 1'-0"



A ELECTRICAL POWER FLOOR PLAN
SCALE: 1/8" = 1'-0"



D ELECTRICAL LIGHTING FLOOR PLAN
SCALE: 1/8" = 1'-0" (ALT #1)



C ELECTRICAL POWER FLOOR PLAN
SCALE: 1/8" = 1'-0" (ALT #1)

GENERAL NOTES:

A. COORDINATE ROUGH-IN LOCATION OF ALL DEVICES WITH ARCHITECTURAL ELEVATIONS, DETAILS, AND PLANS.

B. ALL DEVICES SHALL SHARE COMMON FACEPLATE WHERE APPLICABLE.

C. FOR MECHANICAL EQUIPMENT CONNECTION SCHEDULE. REFER TO DETAIL D/SHEET E2.01.

D. COORDINATE RECEPTACLES HIEGHT WITH OWNER PRIOR TO ROUGH-IN.

E. ALL CIRCUITS SHALL BE LABEL PER NEC.

F. LIGHT FIXTURES SHALL BE CIRCUITED TO CIRCUIT INDICATED IN SPACE.

G. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN (RCP) FOR EXACT LOCATION OF LIGHT FIXTURES. FURNISH FIXTURES WITH TRIM COMPATIBLE WITH THE TYPE OF CEILING AS INDICATED ON THE RCP.

H. EXIT LIGHTS ARE TYPE X, UNO. CONNECT EXIT LIGHT FIXTURES TO UN-SWITCHED CIRCUIT SERVING SPACE IN WHICH FIXTURE IS INSTALLED. INSTALL WALL MOUNTED FIXTURES 8'-0" AFF, UNO.

I. COORDINATE PLACEMENT OF FIXTURES WITH ACTUAL INSTALLATION OF MECHANICAL EQUIPMENT AND DUCTWORK.

J. SWITCH LEGS ARE NOT SHOWN WHERE SWITCHING SCHEME IS OBVIOUS.

K. FIXTURES SHALL BE CIRCUITED TO CIRCUIT INDICATED IN SPACE.

L. CIRCUIT EMERGENCY FIXTURES IN ROOMS TO PERMIT ALL THE LAMPS TO BE SWITCHED OFF, LEAVING THE BATTERY IN STAND BY CONDITION, SO THE EMERGENCY BATTERY UNIT WILL OPERATE ONE LAMP WHEN THE NORMAL POWER IS INTERRUPTED. REQUEST THE REQUIRED WIRING DIAGRAM FROM EQUIPMENT MANUFACTURER. ALL EMERGENCY LIGHTING FIXTURES SHALL BE CIRCUITED TO THE NON-SWITCHED PHASE WIRE IN ADDITION TO THE SWITCHED LEG. ALL EXIT SIGNS SHALL BE CIRCUITED TO THE NON-SWITCHED PHASE WIRE ONLY.

KEY NOTES:

1. EXHAUST FAN SHALL BE SWITCHED WITH LIGHTS.
2. FURNISH AND INSTALL J-BOX FOR CONNECTION OF HAND DRYER. COORDINATE EXACT LOCATION WITH ARCHITECTURAL DRAWINGS. ROUTE 2#10, #10G, 1/2"C.

FIELD VERIFY ALL CONDITIONS

DESIGN DRAWINGS SCHEMATIC. THIS CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING OR AWARD OF CONTRACT TO INSPECT EXISTING FEILD CONDITIONS. THIS CONTRACT SHALL INCLUDE ALL LABOR AND MATERIALS NECCESSARY FOR FEILD MODIFICATIONS DUE TO EXISTING CONDITIONS.

THE CONTRACTOR SHALL CONTACT THE ARCHITECT, ENGINEER OR OWNER PRIOR TO BIDDING FOR INTERPRETATIONS AND CLARIFICATIONS OF THE DESIGN AND INCLUDE IN HIS BID ALL COSTS TO MEET THE DESIGN INTENT. CLARIFICATIONS MADE BY THE ARCHITECT, ENGINEER OR OWNER AFTER BIDDING WILL BE FINAL AND SHALL BE IMPLEMENTED AT CONTRACTORS COST.

BIDDING CONTRACTORS SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES AND SHALL INCLUDE IN THEIR BIDS THE COSTS FOR ALL WORK INSTALLED IN STRICT ACCORDANCE WITH GOVERNING CODES, THE PLANS AND SPECIFICATIONS NOT WITHSTANDING. THE CONTRACTOR SHALL ALERT ARCHITECT, ENGINEER OR OWNER OF ANY APPARENT DISCREPANCIES BETWEEN GOVERNING CODES AND DESIGN INTENT.

LEGEND(LUTRON)

MS	MS-OPS6M2DV-WH
MS	MS-Z101-WH
P	PJ2-2B-GWH-L01 (CW-1-WH)
P3BRL	PJ2-3BRL-GWH-L01 (CW-1-WH)
W	WLCU301
GRX	GRX-CESO-120PKG
LRF2	LRF2-OCR2B-P
HJS2	HJS-2-FM
RMJS16	RMJS-16R-DV-B
RMJS8	RMJS-8T-DV-B

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

E1.03

ELECTRICAL POWER FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

GENERAL NOTES:

A. COORDINATE ROUGH-IN LOCATION OF ALL DEVICES WITH ARCHITECTURAL ELEVATIONS, DETAILS, AND PLANS.

B. ALL DEVICES SHALL SHARE COMMON FACEPLATE WHERE APPLICABLE.

C. ALL ELECTRICAL COMPONENTS OF POOL TO BE BONDED PER NEC 680.

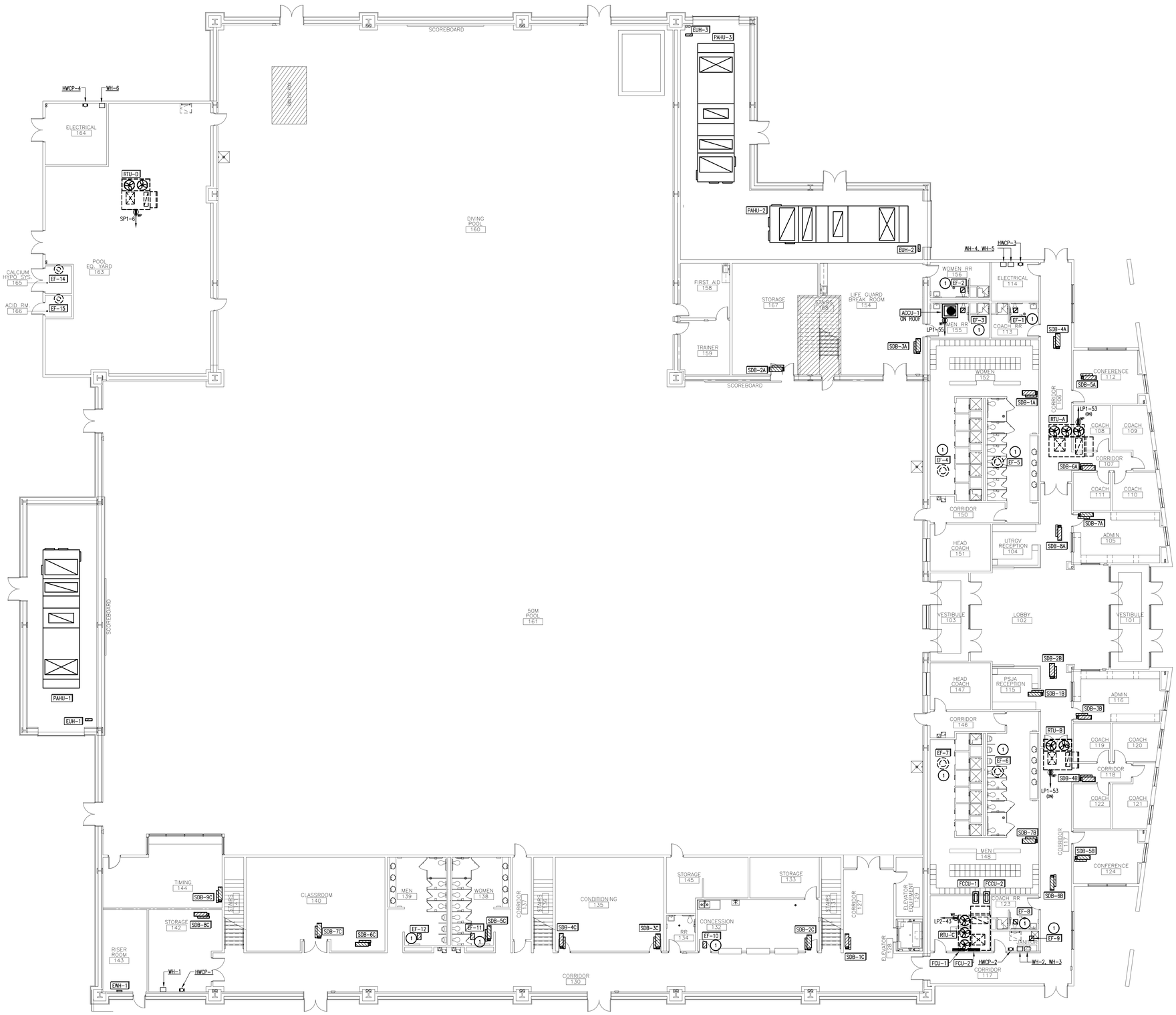
D. COORDINATE RECEPTACLES HIEGHT WITH OWNER PRIOR TO ROUGH-IN.

E. ALL CIRCUITS SHALL BE LABEL PER NEC.

F. FOR MECHANICAL EQUIPMENT CONNECTION SCHEDULE. REFER TO DETAIL D/SHEET E2.01.

KEY NOTES:

(1) EXHAUST FAN SHALL BE SWITCHED WITH LIGHTS.



NORTH

A ELECTRICAL – MECHANICAL AND PLUMBING EQUIPMENT LOCATION FLOOR PLAN

SCALE: 3/32" = 1'-0"

MEP SOLUTIONS ENGINEERING

MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER

06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

E1.04

ELEC-MECH & PLBING
EQUIP LOC FLR PLAN

TIMING SYSTEM SCHEDULE

ID	ITEM	DESCRIPTION
1	WALL PLATE	12X12X6 PVC JUNCTION BOX 18" AFF WITH 120 VAC QUAD OUTLET AND ETHERNET DROP BY OTHERS.
2	TDPI-S2 START DECK NODE	4X4X6 PVC JUNCTION BOX
3	TDPI TIMING DECK NODE	4X4X6 PVC JUNCTION BOX
4	TDPI-BH3 BULKHEAD DECK NODE	4X4X6 PVC JUNCTION BOX
5	TDPI-BH3 BULKHEAD CONNECTOR NODE	4X4X6 PVC JUNCTION BOX

GENERAL NOTES:

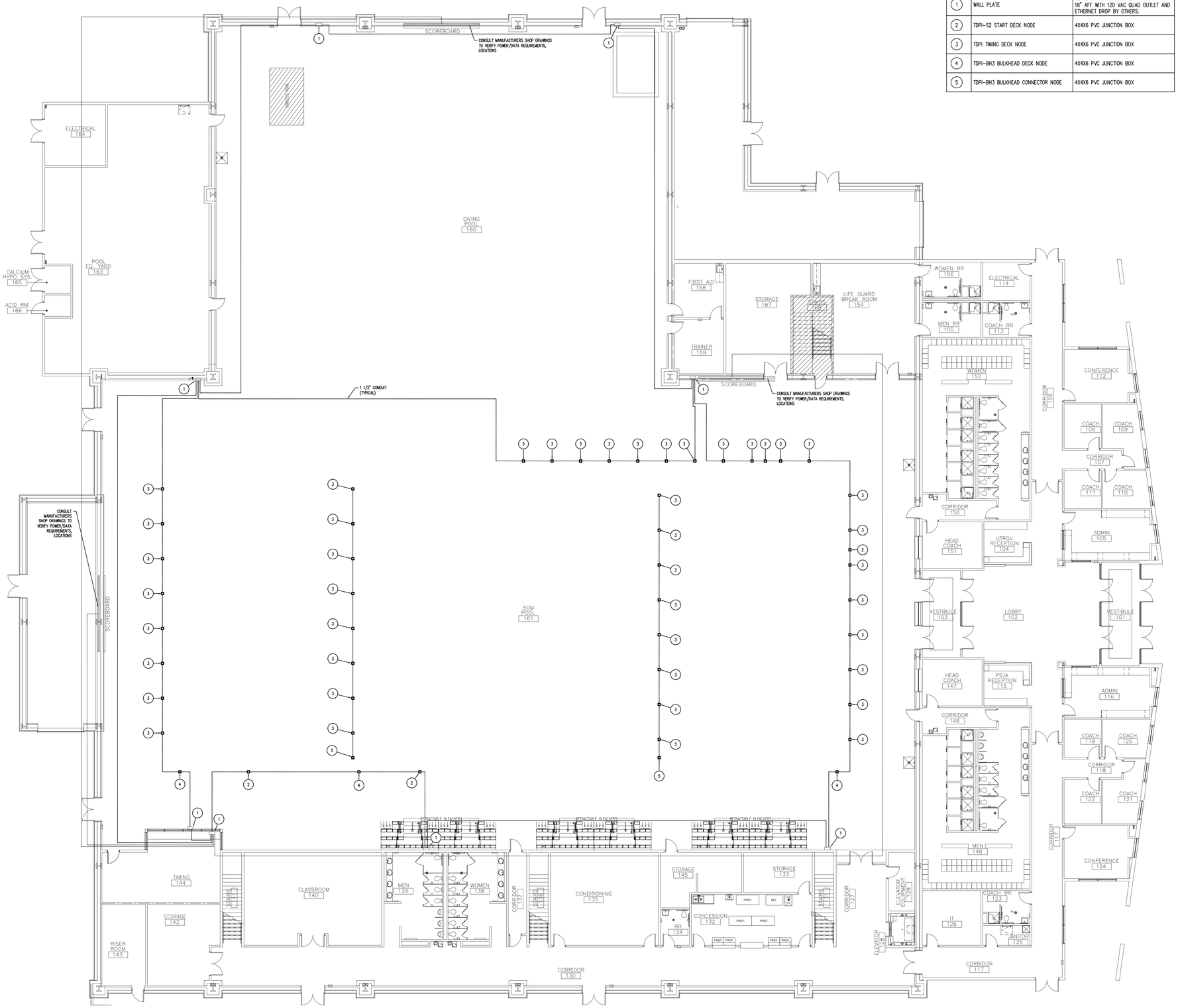
A. COORDINATE ROUGH-IN LOCATION OF ALL DEVICES WITH ARCHITECTURAL ELEVATIONS, DETAILS, AND PLANS.

B. ALL DEVICES SHALL SHARE COMMON FACEPLATE WHERE APPLICABLE.

C. ALL ELECTRICAL COMPONENTS OF POOL TO BE BONDED PER NEC 680.

D. COORDINATE RECEPTACLES HEIGHT WITH OWNER PRIOR TO ROUGH-IN.

E. ALL CIRCUITS SHALL BE LABEL PER NEC.



NORTH

A COMPETITION POOL TIMING SYSTEM LAYOUT

SCALE: 3/32" = 1'-0"

MEP SOLUTIONS ENGINEERING

MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER

06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

E1.05

COMPETITION POOL TIMING SYSTEM LAYOUT

ELECTRICAL LEGEND

ALL SYMBOLS SHOWN MAY NOT APPEAR IN ALL DRAWINGS.
SYMBOLS ARE SHOWN SCHEMATIC AND MAY NOT BE TO SCALE.

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
	2'x4' FLUORESCENT LIGHT FIXTURE	SEE FIX. SCH.
	2'x4' FLUORESCENT LIGHT FIXTURE ON EMERGENCY CIRCUIT	SEE FIX. SCH.
	2'x4' FLUORESCENT LIGHT FIXTURE SWITCHED W/ INBOARD LAMPS ONE SWITCH AND OUTBOARD LAMPS ON ANOTHER	SEE FIX. SCH.
	2'x4' FLUORESCENT FIXTURE W/INBOARD LAMPS ON EMERGENCY CIRCUIT AND OUTBOARD LAMPS ON NORMAL CIRCUIT	SEE FIX. SCH.
	2'x2' FLUORESCENT LIGHT FIXTURE	SEE FIX. SCH.
	2'x2' FLUORESCENT LIGHT FIXTURE ON EMERGENCY CIRCUIT	SEE FIX. SCH.
	FLUORESCENT STRIP LIGHT	SEE FIX. SCH.
	POLE MOUNTED FIXTURE	SEE FIX. SCH.
	TRACK LIGHT	SEE FIX. SCH.
	INCANDESCENT, FLUORESCENT, OR HID WALL WASHER LIGHT FIXTURE CEILING MTD.	SEE FIX. SCH.
	INCANDESCENT, FLUORESCENT, OR HID FIXTURE CLG. OR WALL MTD.	SEE FIX. SCH.
	INCANDESCENT, FLUORESCENT, OR HID FIXTURE ON EMERGENCY CCT. CLG. OR WALL MTD.	SEE FIX. SCH.
	EXIT LIGHT, CEILING OR WALL MOUNTED – SHADING INDICATING SINGLE OR DOUBLE FACE; DIRECTIONAL ARROWS AS INDICATED	9" BFC
$	WALL SWITCH SPST, 20A,120/277V	48" AFF
$ 2	DOUBLE POLE TOGGLE SWITCH, 20A/120/277V	48" AFF
$ 3	3-WAY WALL SWITCH, 20A,120/277V	48" AFF
$ 4	4-WAY WALL SWITCH, 20A,120/277V	48" AFF
$ D	WALL DIMMER SWITCH	48" AFF
$ K	KEY OPERATED WALL SWITCH	48" AFF
$ P	WALL SWITCH WITH PILOT LIGHT	48" AFF
	SINGLE RECEPTACLE – 20A/125V/2P/3W/G NEMA 5-20R	15" AFF
	DUPLEX RECEPTACLE – 20A/125V/2P/3W/G NEMA 5-20R	15" AFF
	DUPLEX RCPT. SPLIT-WIRED – 20A/125V/2P/3W/G NEMA 5-20R	15" AFF
	DUPLEX RCPT. GFI – 20A/125V/2P/3W/G NEMA 5-20R	15" AFF
	QUADRAPLEX RECEPTACLE (TWO DUPLEX RCPTS. UNDER ONE COVERPLATE)	15" AFF
E	ISOLATED GROUND DUPLEX RECEPTACLE – 20A/125V NEMA 5-20R	15" AFF
E	DUPLEX RECEPTACLE ON EMERGENCY CIRCUIT	15" AFF
	FLOOR MOUNTED DUPLEX RECEPTACLE – FLUSH MOUNTED UNO	–
	SPECIAL PURPOSE RECEPTACLE (NEMA NO. AS INDICATED)	15" AFF
J	JUNCTION BOX – SIZE & MOUNTING AS REQUIRED	AS REQD.
	MULTIOUTLET ASSEMBLY – LENGTH AND OUTLET SPACING AS INDICATED	AS NOTED
	TELEPHONE/DATA OUTLET. WALL MOUNTED – STUB 1" C. ABOVE CEILING FROM OUTLET BOX	15" AFF
	FLOOR MOUNTED DATA/TELEPHONE OUTLET – FLUSH MOUNTED UNO	–
TV	TELEVISION OUTLET. CLG. OR WALL MOUNTED – STUB 3/4" C. ABOVE CEILING FROM OUTLET BOX	15" AFF
	PUSHBUTTON	48" AFF
C	CLOCK HANGER OUTLET 15A/125V/2P/3W/G RECEPTACLE	96" AFF
WAP	WIRELESS ACCESS PIONT	–
F	FIRE ALARM PULL STATION	48" AFF
F	FIRE ALARM AUDIBLE/VISUAL SIGNAL	80" AFF
F	FIRE ALARM AUDIBLE SIGNAL	80" AFF
F	FIRE ALARM VISUAL SIGNAL	80" AFF
S	SPEAKER VOICE EVAC SYSTEM	80" AFF
EVAC	VOICE EVAC SYSTEM	–

SYMBOL	DESCRIPTION	MNTG. HT. UNO (SEE NOTE 1)
FS	FIRE ALARM SPRINKLER FLOW SWITCH	–
TS	FIRE ALARM SPRINKLER TAMPER SWITCH	–
TS	FIRE ALARM SPRINKLER TAMPER SWITCH	–
PS	FIRE ALARM SPRINKLER PRESSURE SWITCH	–
S S	FIRE ALARM SMOKE DETECTOR CEILING OR WALL MOUNTED	80" AFF
H H	HEAT DETECTOR CEILING OR WALL MOUNTED	–
D	DUCT SMOKE DETECTOR	–
	SMOKE DOOR HOLDER	–
FACP	FIRE ALARM CONTROL PANEL	–
FAAP	FIRE ALARM ANNUNCIATOR PANEL	–
S S	P.A. SPEAKER, CEILING OR WALL MOUNTED	9" BFC
M	MICROPHONE OUTLET	–
30/–/3	DISCONNECT SWITCH – 30/–/3 INDICATES 30A, 3-POLE, NONFUSED; 30/30/3 INDICATES 30A, 3-POLE, 30A FUSE	AS REQD.
CB 30/3	CIRCUIT BREAKER DISCONNECT SWITCH – THERMAL MAGNETIC CB IN NEMA 1 ENCL; AMPS/POLES AS INDICATED	AS REQD.
30/30/3	DISCONNECT SWITCH – 30/30/3 INDICATES 30A, 3-POLE, 30A FUSE	AS REQD.
2	MOTOR STARTER FVNR UNO; NUMBER INDICATES NEMA SIZE	AS REQD.
CB 2	COMBINATION MOTOR CONTROLLER/DISCONNECT SWITCH	AS REQD.
	MOTOR	–
	PANELBOARD	–
	CIRCUIT HOME RUN TO PANELBOARD (2 #12, 1 #12G, 1/2"C. 20A/1P CB UNO)	–
X,X,X	THREE SINGLE POLE DEVICE CIRCUIT NUMBERS	–
X/X/X	MULTI-POLE DEVICE CIRCUIT NUMBERS	–
MD MD	MOTION DETECTOR, CEILING OR WALL MOUNTED	–
DH	DOOR HOLDER– REFER TO ARCHITECTURAL DOOR SCHEDULE FOR DOOR ROUGH-IN REQUIREMENTS.	–
C	CHIME/STROBE	80"AFF
B	BELL/BUZZ	48"AFF
G	GLASS BREAK MOTION SENSOR	–
D	DOOR CONTACTS	–
K	KEYPAD	48"AFF
	CAMERA	–
CR	CARD READER – REFER TO DISCRIPTION IN DOOR HARDWARE SPECIFICATION SECTION.	48"AFF

ELECTRICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	NL	NIGHT LIGHT
BFC	BELOW FINISHED CEILING	NO (N.O.)	NORMALLY OPEN
C	CONDUIT	RCPT(S)	RECEPTACLE(S)
CB	CIRCUIT BREAKER	PNL	PANEL
EC	EMPTY CONDUIT	SO (S.O.)	SPACE ONLY
EX	EXISTING	SP	SPARE
F	FUSE	ST (S.T.)	SHUNT TRIP
G	GROUND (EQUIPMENT)	SW	SWITCH
GFI	GROUND FAULT INTERRUPTER	UF	UNDERFLOOR
IC	INTERRUPTING CAPACITY	UG	UNDERGROUND
IG	ISOLATED GROUND	UNO(U.N.O.)	UNLESS NOTED OTHERWISE
MTD	MOUNT OR MOUNTED	WG	WIRE GUARD
NC (N.C.)	NORMALLY CLOSED	WP	WEATHERPROOF
NF	NONFUSED	XFMR	TRANSFORMER
NIC	NOT IN CONTRACT		

NOTES:
1. 48" AFF INDICATES TO TOP OF DEVICE;
   15" AFF INDICATES TO BOTTOM OF DEVICE;
   ALL OTHER MOUNTING HEIGHTS REFER TO CENTERLINE OF DEVICE.

A ELECTRICAL LEGEND
SCALE: N.T.S.

MECHANICAL EQUIPMENT CONNECTION SCHEDULE

MECHANICAL EQUIPMENT				DISCONNECTING MEANS AND/OR
UNIT DESIGNATION	CIRCUIT DESIGNATION	LOCATION	NOTES	BRANCH CIRCUIT SIZE
PAHU-1	MSB-2,4,6	INDOOR	1,4	3#350KCMIL, #4G, 3"C
PAHU-2	MSB-8,10,12	INDOOR	1,4	3#350KCMIL, #4G, 3"C
PAHU-3	MSB-14,16,18	INDOOR	1,4	3#270, #6G, 2"C
PAFC-1	M3-8,10,12	OUTDOOR	1	60/-/3 NEMA 3R DISCONNECT, 3#6, #10G, 3/4"C
PAFC-2	M3-14,16,18	OUTDOOR	1	60/-/3 NEMA 3R DISCONNECT, 3#6, #10G, 3/4"C
PAFC-3	M3-20,22,24	OUTDOOR	1	30/-/2 NEMA 3R DISCONNECT, 2#10, #10G, 3/4"C
RTU-A	M1-2,4,6	ROOF	1,4	3#4, #10G, 1"C
RTU-B	M1-8,10,12	ROOF	1,4	3#6, #10G, 3/4"C
RTU-C	M2-2,4,6	ROOF	1,4	3#4, #10G, 1"C
RTU-D	M3-2,4,6	ROOF	1,4	3#6, #10G, 3/4"C
AHU-1	LP1-63,65	PRIVATE VIEWING ROOM 205	1	100/-/3 DISCONNECT, 3#4, #8G, 1"C
ACCU-1	LP1-67,69	EXTERIOR		60/-/3 NEMA 3R DISCONNECT, 3#8, #10G, 1/2"C
SDB-1A	M1-1,3,5	WOMEN 152	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-2A	M1-1,3,5	STORAGE 167	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-3A	M1-7,9,11	LIFE GUARD BREAK RM 164	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-4A	M1-7,9,11	CORRIDOR 106	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-5A	M1-13,15,17	CONFERENCE 112	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-6A	M1-13,15,17	CORRIDOR 107	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-7A	M1-13,15,17	ADMIN 105	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-8A	M1-13,15,17	UTRGV RECEPTION 104	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-1B	M1-19,21,23	PSJA RECEPTION 115	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-2B	M1-19,21,23	PSJA RECEPTION 115	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-3B	M1-19,21,23	ADMIN 116	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-4B	M1-25,27,29	CORRIDOR 118	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-5B	M1-25,27,29	CONFERENCE 124	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-6B	M1-31,33,35	CORRIDOR 117	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-7B	M1-31,33,35	MEN 148	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-1C	M2-8,10,12	CORRIDOR 127	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-2C	M2-8,10,12	CORRIDOR 130	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-3C	M2-8,10,12	CONCESSION 132	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-4C	M2-14,16,18	CONDITIONING 135	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-5C	M2-14,16,18	CORRIDOR 130	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-6C	M2-14,16,18	WOMEN 138	6	30/15F/3 DISCONNECT, 4#12, #12G, 1/2"
SDB-7C	M2-20,22,24	CLASSROOM 140	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-8C	M2-20,22,24	STORAGE 142	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
SDB-9C	M2-20,22,24	STORAGE 142	6	30/15F/3 DISCONNECT, 4#10, #10G, 3/4"
FCU-1/FCCU-1	LP1-71,73	IT 126	5	30/-/2 NEMA 3R DISCONNECT, 2#12, #12G, 1/2"C
FCU-2/FCCU-2	LP1-75,77	IT 126	5	30/-/2 NEMA 3R DISCONNECT, 2#12, #12G, 1/2"C
EF-1	L1-43	COACH RR 113	2	2#12, #12G, 1/2"C
EF-2	L1-43	WOMEN RR 156	2	2#12, #12G, 1/2"C
EF-3	L1-43	MEN RR 155	2	2#12, #12G, 1/2"C
EF-4	LP1-57	WOMEN 152	2,7	2#12, #12G, 1/2"C
EF-5	LP1-57	WOMEN 152	2,7	2#12, #12G, 1/2"C
EF-6	LP1-59	MEN 148	2,7	2#12, #12G, 1/2"C
EF-7	LP1-59	MEN 148	2,7	2#12, #12G, 1/2"C
EF-8	L1-51	COACH RR 123	2	2#12, #12G, 1/2"C
EF-9	L1-51	JANITOR 125	2	2#12, #12G, 1/2"C
EF-10	LP2-64	RR 134	2,7	2#12, #12G, 1/2"C
EF-11	LP2-66	WOMEN 138	2,7	2#12, #12G, 1/2"C
EF-12	LP2-66	MEN 139	2,7	2#12, #12G, 1/2"C
EF-13	L1-59	RR 206	2	2#12, #12G, 1/2"C
EF-14	SP1-42	CALCIUM HYP. SYS. 165	9	2#12, #12G, 1/2"C
EF-15	SP1-42	ACID RM. 166	9	2#12, #12G, 1/2"C
WH-1	LP2-52	STORAGE 142	8	2#12, #12G, 1/2"C
WH-2	LP1-64	JANITOR 125	8	2#12, #12G, 1/2"C
WH-3	LP1-66	JANITOR 125	8	2#12, #12G, 1/2"C
WH-4	LP1-68	ELECTRICAL 114	8	2#12, #12G, 1/2"C
WH-5	LP1-70	ELECTRICAL 114	8	2#12, #12G, 1/2"C
WH-6	SP1-16	ELECTRICAL 164	8	2#12, #12G, 1/2"C
HWCP-1	LP2-54	STORAGE 142	3	2#12, #12G, 1/2"C
HWCP-2	LP1-72	JANITOR 125	3	2#12, #12G, 1/2"C
HWCP-3	LP1-74	ELECTRICAL 114	3	2#12, #12G, 1/2"C
HWCP-4	SP1-18	ELECTRICAL 164	3	2#12, #12G, 1/2"C
EWH-1	LP2-68,70	RISER ROOM 143		30/-/2 DISCONNECT, 2#10, #10G, 1/2"C
EUH-1	LP1-31,33,35	MECHANICAL ROOM		60/-/3 DISCONNECT, 4#8, #10G, 3/4"C
EUH-2	LP1-37,39,41	MECHANICAL ROOM		60/-/3 DISCONNECT, 4#8, #10G, 3/4"C
EUH-3	LP2-31,33,35	MECHANICAL ROOM		60/-/3 DISCONNECT, 4#8, #10G, 3/4"C

GENERAL NOTES:
A. ALL DISCONNECTS AND COMBINATION STARTERS ARE NEMA 1 ENCLOSED, UNO.
B. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH DIV. 15 AND FURNISH AND INSTALL POWER FOR CONTROLS.

NOTES:
1. FURNISH AND INSTALL DUCT SMOKE DETECTOR AT SUPPLY & RETURN DUCT.
2. EXHAUST FAN SHALL BE SWITCHED WITH LIGHTS.
3. FURNISH AND INSTALL CERUS BUILDING AUTOMATION STARTER @BAS-1P. FURNISH 7-DAY, 24 HOUR, PROGRAMMABLE, ASTRONOMICAL TIME CLOCK.
4. VFD FURNISHED BY MEHCANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR.
5. FURNISH AND INSTALL MOTOR RATED SWITCH ABOVE ACCESSIBLE CEILING FOR FCU. FEED THRU FCCU.
6. MULTIPLE UNITS SHALL BE CONNECTED TO SINGLE CIRCUIT. FURNISH AND INSTALL ILSCO NIMBUS MULTITAP CONNECTORS FOR TAP.
7. FURNISH AND INSTALL INTERPOSING RELAY FOR 277/120 INTERFACE, SQUARED CLASS 8501 TYPE C RELAY CO6 V04, 27VOLT NEMA 1 ENCLOSURE 9991 UE1.
8. FURNISH AND INSTALL RECEPTACLE FOR CONNECTION OF WATER HEATER.
9. FURNISH INDIVIDUAL SWITCH FOR FAN.

D ELECTRICAL – MECHANICAL EQUIPMENT CONNECTION SCHEDULE
SCALE: N.T.S.

TRANSFORMER SCHEDULE

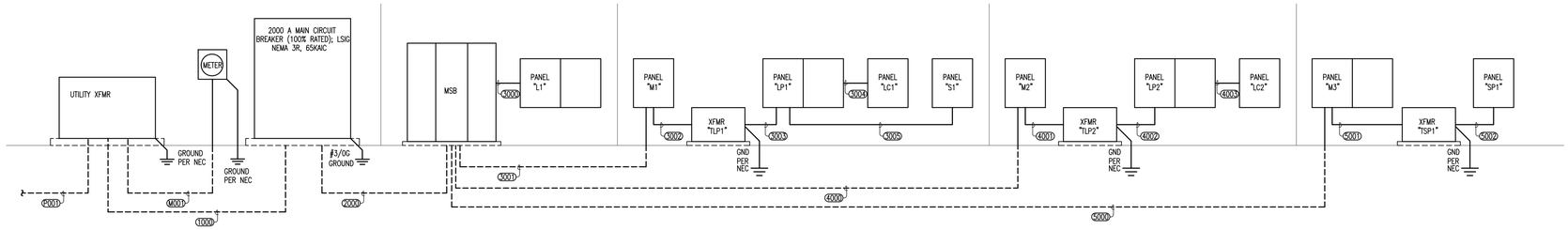
MARK	KVA	PRIMARY VOLTAGE	SECONDARY VOLTAGE	GROUNDING ELECTRODE	REMARKS
XFMR-TLP1	112-1/2	480V DELTA	208Y/120 GND WYE	#1/0	----
XFMR-TLP2	112-1/2	480V DELTA	208Y/120 GND WYE	#1/0	----
XFMR-TSP1	37-1/2	480V	120/240V	#4	----

B ELECTRICAL TRANSFORMER SCHEDULE
SCALE: N.T.S.

FEEDER / BRANCH CIRCUIT SCHEDULE

MARK	RACEWAY	PHASE CONDUCTORS	NEUTRAL CONDUCTORS	GROUND CONDUCTORS	REMARKS
P001	4"	----	----	----	----
M001	1-1/4"	----	----	----	----
1000	4"	3#600KCMIL	1#600KCMIL	1#250KCMIL	FIVE PARALLEL FEEDERS REQUIRED
2000	4"	3#600KCMIL	1#600KCMIL	1#250KCMIL	FIVE PARALLEL FEEDERS REQUIRED
3000	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
3001	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
3002	2"	3#4/0	-----	1#4	----
3003	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
3004	1 1/2"	3#2	1#3/0	1#8	----
3005	2 1/2"	3#3/0	2#3/0	1#6	----
4000	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
4001	2"	3#4/0	-----	1#4	----
4002	2"	3#3/0	1#3/0	1#3	TWO PARALLEL FEEDERS REQUIRED
4003	2 1/2"	3#4/0	2#4/0	1#4	----
5000	2"	3#3/0	1#3/0	1#1	THREE PARALLEL FEEDERS REQUIRED
5001	1-1/4"	2#1	----	1#6	----
5002	2"	2#3/0	1#3/0	1#6	----

E ELECTRICAL FEEDER/BRANCH CIRCUIT SCHEDULE
SCALE: N.T.S.



C ELECTRICAL RISER DIAGRAM
SCALE: N.T.S.

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-8748

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

E2.01

ELECTRICAL RISER DIA, LEGEND & SCHEDULES

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER & MODEL #	LAMPS/TEMP/VA	VOLTAGE
A	2X4 EDGE LIT FLAT PANEL FIXTURE	LITHONIA #EPANL 2X4 4800LM 40K MIN1 ZT MVOLT LEDALUX #ECOPNL-2X4-70-U-4K METALUX #24FP4740C SIGNIFY #2FXP48L840-4-DS-UNV-DIM	LED 4000K 47	120/277
AE	2X4 EDGE LIT FLAT PANEL FIXTURE EMERGENCY BATTERY PACK	LITHONIA #EPANL 2X4 4800LM 40K MIN1 ZT MVOLT E10WCP LEDALUX #ECOPNL-2X4-70-U-4K-BU METALUX #24FP4740C-EL14W SIGNIFY #2FXP48L840-4-DS-UNV-DIM-EMLED	LED 4000K 47	120/277
B	2X4 EDGE LIT FLAT PANEL FIXTURE	LITHONIA #EPANL 2X4 3000LM 40K MIN1 ZT MVOLT LEDALUX #ECOPNL-2X4-50-U-4 METALUX #24FP3140C SIGNIFY #2FXP38L840-4-DS-UNV-DIM	LED 4000K 39	120/277
BE	2X4 EDGE LIT FLAT PANEL FIXTURE EMERGENCY BATTERY PACK	LITHONIA #EPANL 2X4 3000LM 40K MIN1 ZT MVOLT E10WCP LEDALUX #ECOPNL-2X4-50-U-4K-BU METALUX #24FP3140C-EL14W SIGNIFY #2FXP38L840-4-DS-UNV-DIM-EMLED	LED 4000K 39	120/277
C	6" RECESSED DOWNLIGHT	LITHONIA #LDN6 40/10 L06 AR MVOLT CONTECH LIGHTING #R6NC-1-40K-12-D / C6322M-CLR HALO COMMERCIAL #PD610ED010-PDM6A840-61VC SIGNIFY #6RN / P6RDL10840CLZ10U	LED 4000K 13	120/277
CE	6" RECESSED DOWNLIGHT EMERGENCY BATTERY PACK	LITHONIA #LDN6 40/10 L06 AR MVOLT EM CONTECH LIGHTING #R6NC-1-40K-12-D-ER / C6322M-CLR HALO COMMERCIAL #PD610ED010EM-PDM6A840-61VC SIGNIFY #6RNEM / P6RDL10840CLZ10U	LED 4000K 13	120/277
D	6" RECESSED DOWNLIGHT	LITHONIA #LDN6 40/20 L06 AR MVOLT CONTECH LIGHTING #R6NC-3-40K-12-D-ER / C6322M-CLR HALO COMMERCIAL #PD620ED010-PDM6A840-61VC SIGNIFY #6RN / P6RDL20840CLZ10U	LED 4000K 23	120/277
DE	6" RECESSED DOWNLIGHT EMERGENCY BATTERY PACK	LITHONIA #LDN6 40/20 L06 AR MVOLT EM CONTECH LIGHTING #R6NC-3-40K-12-D-ER / C6322M-CLR HALO COMMERCIAL #PD620ED010EM-PDM6A840-61VC SIGNIFY #6RNEM / P6RDL20840CLZ10U	LED 4000K 23	120/277
F	4' STRIPLIGHT	LITHONIA #ZL1N L48 3000LM FST MVOLT 40K WH METALUX #4SNLED-33SL-LW-UNV-L840-CD1 LSI S-4-LED-SS-NW-UE SIGNIFY #FSS430L840-UNV-DIM	LED 4000K 33	120/277
FE	4' LED STRIPLIGHT EMERGENCY BATTERY PACK	LITHONIA #ZL1N L48 3000LM FST MVOLT 40K 80CRI E7W WH METALUX #4SNLED-33SL-LW-UNV-EL7W-L840-CD1 LSI S-4-LED-SS-NW-UE-EM SIGNIFY #FSS430L840-UNV-DIM-EMLED	LED 4000K 33	120/277
G2	2' RECESSED PERIMETER LIGHTING	MARK ARCHITECTURAL #SPRLED LOP 2FT RLP FL 80CRI 40K 400LMF MVOLT CORONET #FLAWLESS LED 2 40 LTG1 UNV	LED 4000K 7	120/277
G3	3' RECESSED PERIMETER LIGHTING	MARK ARCHITECTURAL #SPRLED LOP 3FT RLP FL 80CRI 40K 400LMF MVOLT CORONET #FLAWLESS LED 3 40 LTG1 UNV	LED 4000K 10	120/277
G4	4' RECESSED PERIMETER LIGHTING	MARK ARCHITECTURAL #SPRLED LOP 4FT RLP FL 80CRI 40K 400LMF MVOLT CORONET #FLAWLESS LED 4 40 LTG1 UNV	LED 4000K 14	120/277
H3	3' ZIPTWO LED SYSTEM STANDARD OUTPUT 120 DEGREE SYMMETRIC	VODE LIGHTING #707-Z2 3' ZZ XX AE 2 0 Z SO 40K S3 0 XX CORONET #RUSH REC LED 3' 40 LTG1 UNV	LED 4000K 21	120/277
H4	4' ZIPTWO LED SYSTEM STANDARD OUTPUT 120 DEGREE SYMMETRIC	VODE LIGHTING #707-Z2 4' ZZ XX AE 2 0 Z SO 40K S3 0 XX CORONET #RUSH REC LED 4' 40 LTG1 UNV	LED 4000K 28	120/277
H4E	4' ZIPTWO LED SYSTEM STANDARD OUTPUT 120 DEGREE SYMMETRIC EMERGENCY BATTERY PACK	VODE LIGHTING #707-Z2 4' ZZ XX AE 2 0 Z SO 40K S3 0 XX EM CORONET #RUSH REC LED 4' 40 LTG1 UNV EM	LED 4000K 28	120/277
K	POLARIS LED FLOOD LIGHT	SPECGRADE LED #AFL 800 40K XX V01 XX XX VDIM NAT	LED 4000K 800	120/277
KE	POLARIS LED FLOOD LIGHT EMERGENCY BATTERY PACK	SPECGRADE LED #AFL 800 40K XX V01 XX XX VDIM NAT	LED 4000K 800	120/277

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER & MODEL #	LAMPS/TEMP/VA	VOLTAGE
M	THE MARINER 4' VAPOR TIGHT LINEAR EMERGENCY BATTERY PACK	SOLAS RAY LIGHTING #LQ-H4-112-50-X-XX	LED 4000K 127	120/277
ME	THE MARINER 4' VAPOR TIGHT LINEAR EMERGENCY BATTERY PACK	SOLAS RAY LIGHTING #LQ-H4-112-50-X-XX-BB	LED 4000K 127	120/277
NE	4' STAIRWAY FIXTURE EMERGENCY BATTERY PACK DIMS TO 10% UNOCCUPIED	LITHONIA #WL4 30L LP840 MSD7 DIM10 EL14L METALUX #4SWLED-LD4-32SL-LW-UNV-EL14W-L840-CD1-SVPD2 ILP CK.4-30WLED-UNIV-40-USBD/HL SIGNIFY #SF4C33A40UDZT-US-EMLED	LED 4000K 30	120/277
P	2'X4' EDGE LIT FLAT PANEL FIXTURE DRYWALL GRID ADAPTER	LITHONIA #EPANL 2X4 4800LM 40K MIN1 ZT MVOLT DGA24 LEDALUX #ECOPNL-2X4-70-U-4K-FLK24 METALUX #24FP4740C-DF-4W-U SIGNIFY #2FXP48L840-4-DS-UNV-DIM-FMA24	LED 4000K 47	120/277
Q	2'X4' EDGE LIT FLAT PANEL FIXTURE DRYWALL GRID ADAPTER	LITHONIA #EPANL 2X4 3000LM 40K MIN1 ZT MVOLT DGA24 LEDALUX #ECOPNL-2X4-50-U-4K-FLK24 METALUX #24FP3140C-DF-4W-U SIGNIFY #2FXP38L840-4-DS-UNV-DIM-FMA24	LED 4000K 39	120/277
QE	2'X4' EDGE LIT FLAT PANEL FIXTURE EMERGENCY BATTERY PACK DRYWALL GRID ADAPTER	LITHONIA #EPANL 2X4 3000LM 40K MIN1 ZT MVOLT E10WCP DGA24 LEDALUX #ECOPNL-2X4-50-U-4K-FLK24-BU METALUX #24FP3140C-EL14W-DF-4W-U SIGNIFY #2FXP38L840-4-DS-UNV-DIM-EMLED-FMA24	LED 4000K 39	120/277
SA	SINGLE HEAD ARM MOUNTED AREA LIGHT TYPE R3 DISTRIBUTION 30' POLE, 24" PEDESTAL	LITHONIA #RSX2 LED P2 40K R3	LED 4000K 114	120/277
SB	FOUR HEAD ARM MOUNTED AREA LIGHT TYPE R5 DISTRIBUTION 30' POLE, 24" PEDESTAL	LITHONIA #RSX2 LED P2 40K R5	LED 4000K 456	120/277
SC	ARCHITECTURAL WALL SCONCE TYPE FORWARD THROW DISTRIBUTION FINISH AS SELECTED BY ARCHITECT	LITHONIA #WST LED P3 40K VF MVOLT RAYON #T630LED 40 UNI12 40 T3 BZ McGRAW-EDISON #IST-AF-1000-LED-E1-T4FT-XX SIGNIFY #101L-32L-700-NW-G1-4-UNV-XX	LED 4000K 50	120/277
SD	TESIS IN-GROUND LUMINAIRE RECESSED HOUSING POLYMER	ERCO #33640.000	LED 4000K 20	120/277
SF	M97000C IN-GRADE LUMINAIRE	HYDREL #M97000C LED P2 40K WWD	LED 4000K 35	120/277
SH	16" SITE IN-GROUND LUMINAIRE GRAZING LIGHT WALLWASHER	ERCO #32848.023	LED 3000K 24	120/277
SJ	THREE HEAD ARM MOUNTED AREA LIGHT TYPE R3 DISTRIBUTION 30' POLE, 24" PEDESTAL	LITHONIA #RSX2 LED P2 40K R3	LED 4000K 342	120/277
SK4	4' RHYTHM LINEAR LED FLOOD WALL WASH DISTRIBUTION, ADJUSTABLE SURFACE MOUNT 18" EXTENDED ARM WITH STRUT, HALF VISOR	HYDREL #RHY4 SSBR WHT41K MVOLT WWD ASM EASRM18 HVSR CSL20 ETE BBD	LED 4100K 57	120/277
SL	4' LINEAR LED FLOOD LIGHT	HYDREL #4750L 4FT 2000LMF 40K VNSP	LED 4000K 64	120/277
X	UNIVERSAL EXIT LIGHT WITH BATTERY PACK,	LITHONIA #LQMSW3R120/277ELN MULE #MX-B-R-U SURE-LITES #LPX7 EELP #XE2RW-EM	LED'S FURNISHED	120/277

A ELECTRICAL LIGHTING FIXTURE SCHEDULE

SCALE: N.T.S.

HVLS FAN SCHEDULE

UNIT	HVLS-1, HVLS-2
SPACE SERVED	SPECTATOR AREA
AIRFLOW AT 100% SPEED (CFM)	86,400
AIRFLOW AT 80% SPEED (CFM)	69,000
AIRFLOW AT 60% SPEED (CFM)	50,500
AIRFLOW AT 40% SPEED (CFM)	34,300
AIRFLOW AT 20% SPEED (CFM)	18,800
FAN TYPE	DIRECT DRIVE
FAN MOTOR HP	3/4
MAX RATED CURRENT (A)	1.9
VOLTAGE	460/3/60
MAX DIAMETER (FT)	14
NUMBER OF FAN BLADES	5
MAX OP WEIGHT (LB)	168
NOTES	ALL

NOTES:
1. FAN CFM AIRFLOW SHALL BE RATED PER AMCA 230-15.
2. PROVIDE NEMA 4X VFD REMOTE MOUNTED MOTOR CONTROLLER. FAN MOUNTED MOTOR CONTROLLERS ARE NOT ACCEPTABLE.
3. PROVIDE REMOTE MOUNTED TOUCHSCREEN NETWORK INTERFACE WITH BACNET CAPABILITY FOR BAS INTERFACE.
4. PROVIDE DIRECT DRIVE MOTOR. GEAR DRIVEN SYSTEMS ARE NOT ALLOWED.
5. SEE SPECIFICATION FOR CONSTRUCTION AND OTHER REQUIREMENTS.

B ELECTRICAL HVLS FAN SCHEDULE

SCALE: N.T.S.

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
ABRAM L. DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT	971605
DATE	06/07/2019
REVISED	

E3.01

ELECTRICAL LIGHTING FIXTURE SCHEDULE

PANELBOARD MSB

VOLTAGE: 480Y/277 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
2000 A MAIN LUGS ONLY — MOUNTING: SURFACE
BUSES: MAIN – 2000 A; NEUTRAL – 100%; EQUIPMENT GROUND, SPD PANELBOARD — Isc = 65,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	10080	64136	PANEL M1	400/3	1	A	2	300/3	PAHU-1	0	0	59638
0	10440	69654	*	–	3	B	4	–	*	0	0	59638
0	10080	70593	*	–	5	C	6	–	*	0	0	59368
3799	5940	43756	PANEL M2	400/3	7	A	8	300/3	PSHU-2	0		59638
1505	4500	47097	*	–	9	B	10	–	*	0		59368
1280	6480	45898	*	–	11	C	12	–	*	0		59638
1384	2880	95863	PANEL M3	600/3	13	A	14	200/3	PAHU-3	0		37911
0	3060	93411	*	–	15	B	16	–	*	0		37911
0	0	78943	*	–	17	C	18	–	*	0		37911
45697	0	513	PANEL L1	400/3	19	A	20	150/3	ELEVATOR (25 HP)	0		9030
43499	0	196	*	–	21	B	22	–	*	0		9030
38498	0	25	*	–	23	C	24	–	*	0		9030
0			SPACE & BUS	225/3	25	A	26	400/3	SPACE & BUS	0		
0			*	–	27	B	28	–	*	0		
0			*	–	29	C	30	–	*	0		
0			SPACE	20/1	31	A	32	20/1	SPACE	0		
0			SPACE	20/1	33	B	34	20/1	SPACE	0		
0			SPACE	20/1	35	C	36	20/1	SPACE	0		
0			SPACE	20/1	37	A	38	60/3	SURGE PROTECTIVE DEVICE	0		
0			SPACE	20/1	39	B	40	–	*	0		
0			SPACE	20/1	41	C	42	–	*	0		

VA:L (LIGHTING)	135662	CONNECTED	169578	DEMAND
VA:R (RECEPTACLES)	53460	CONNECTED	31730	DEMAND
VA:O (OTHER)	1108196	CONNECTED	1108196	DEMAND
VA: TOTAL	1297318	CONNECTED	1309504	DEMAND
AMPS: TOTAL	1560	CONNECTED	1575	DEMAND

L	R	O		TOTAL			
50880	18900	370485	VA CONNECTED TO A PHASE	440265	VA =	1589	AMPS CONNECTED TO A PHASE @ 277 VOLTS
45004	18000	376305	VA CONNECTED TO B PHASE	439309	VA =	1586	AMPS CONNECTED TO B PHASE @ 277 VOLTS
39778	16560	361406	VA CONNECTED TO C PHASE	417744	VA =	1508	AMPS CONNECTED TO C PHASE @ 277 VOLTS
135662	53460	1108196	TOTAL	1297318	VA		

PANELBOARD L1 – Section 1

VOLTAGE: 480Y/277 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
400 A MAIN LUGS ONLY — MOUNTING: SURFACE
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND, SPD PANELBOARD — Isc = 42,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
4000			LIGHTING-POOL AREA	20/1	1	A	2	20/1	LIGHTING-POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	3	B	4	20/1	LIGHTING-POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	5	C	6	20/1	LIGHTING-POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	7	A	8	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	9	B	10	20/1	LIGHTING-DIVING POOL AREA	4000		
3000			LIGHTING-POOL AREA	20/1	11	C	12	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	13	A	14	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	15	B	16	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	17	C	18	20/1	LIGHTING-DIVING POOL AREA	3000		
3000			LIGHTING-POOL AREA	20/1	19	A	20	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	21	B	22	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	23	C	24	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	25	A	26	20/1	LIGHTING-DIVING POOL AREA	4000		
4000			LIGHTING-POOL AREA	20/1	27	B	28	20/1	LIGHTING-DIVING POOL AREA	3000		
4000			LIGHTING-POOL AREA	20/1	29	C	30	20/1	SPARE	0		
0			SPARE	20/1	31	A	32	20/1	SPARE	0		
0			SPARE	20/1	33	B	34	20/1	SPARE	0		
0			SPARE	20/1	35	C	36	20/1	SPARE	0		
0			SPACE	20/1	37	A	38	20/1	SPACE	0		
0			SPACE	20/1	39	B	40	20/1	SPACE	0		
0			SPACE	20/1	41	C	42	20/1	SPACE	0		

PANELBOARD L1 – Section 2

3057		513	LIGHTING/EF-1,2,3	20/1	43	A	44	20/1	SPARE	0		
792			LIGHTING	20/1	45	B	46	20/1	SPARE	0		
1704			LIGHTING	20/1	47	C	48	20/1	SPARE	0		
790			LIGHTING	20/1	49	A	50	20/1	SPARE	0		
1205		196	LIGHTING/EF-8,9	20/1	51	B	52	20/1	SPARE	0		
2129			EXTERIOR LIGHTING	20/1	53	C	54	20/1	SPARE	0		
2850			SITE LIGHTING	20/1	55	A	56	20/1	SPARE	0		
2502			SITE LIGHTING	20/1	57	B	58	20/1	SPARE	0		
665		25	LIGHTING (2ND FLOOR ALT.)/EF-13	20/1	59	C	60	20/1	SPARE	0		
0			SPARE	20/1	61	A	62	20/1	SPARE	0		
0			SPARE	20/1	63	B	64	20/1	SPARE	0		
0			SPARE	20/1	65	C	66	20/1	SPARE	0		
0			SPACE	20/1	67	A	68	20/1	SPARE	0		
0			SPACE	20/1	69	B	70	20/1	SPARE	0		
0			SPACE	20/1	71	C	72	20/1	SPARE	0		
0			SPACE	20/1	73	A	74	20/1	SPACE	0		
0			SPACE	20/1	75	B	76	20/1	SPACE	0		
0			SPACE	20/1	77	C	78	20/1	SPACE	0		
0			SPACE	20/1	79	A	80	30/3	SURGE PROTECTIVE DEVICE	0		
0			SPACE	20/1	81	B	82	20/1	*	0		
0			SPACE	20/1	83	C	84	20/1	*	0		

VA:L (LIGHTING)	127694	CONNECTED	159618	DEMAND
VA:R (RECEPTACLES)	0	CONNECTED	0	DEMAND
VA:O (OTHER)	734	CONNECTED	734	DEMAND
VA: TOTAL	128428	CONNECTED	160352	DEMAND
AMPS: TOTAL	154	CONNECTED	193	DEMAND

L	R	O		TOTAL			
45697	0	513	VA CONNECTED TO A PHASE	46210	VA =	167	AMPS CONNECTED TO A PHASE @ 277 VOLTS
43499	0	196	VA CONNECTED TO B PHASE	43695	VA =	158	AMPS CONNECTED TO B PHASE @ 277 VOLTS
38498	0	25	VA CONNECTED TO C PHASE	38523	VA =	139	AMPS CONNECTED TO C PHASE @ 277 VOLTS
127694	0	734	TOTAL	128428	VA		

PANELBOARD M1

VOLTAGE: 480Y/277 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
400 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND — Isc = 42,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0		2833	SDB-1A,2A	20/3	1	A	2	60/3	RTU A	0		10420
0		2833	*	–	3	B	4	–	*	0		10420
0		2833	*	–	5	C	6	–	*	0		10420
0		3333	SDB-3A,4A	20/3	7	A	8	50/3	RTU-B	0		9533
0		3333	*	–	9	B	10	–	*	0		9533
0		3333	*	–	11	C	12	–	*	0		9533
0		4333	SDB-5A,6A,7A,8A	30/3	13	A	14	20/1	SPARE	0		
0		4333	*	–	15	B	16	20/1	SPARE	0		
0		4333	*	–	17	C	18	20/1	SPARE	0		
0		4167	SDB-1B,2B,3B	30/3	19	A	20	20/1	SPARE	0		
0		4167	*	–	21	B	22	20/1	SPARE	0		
0		4167	*	–	23	C	24	20/1	SPARE	0		
0		2667	SDB-4B,5B	20/3	25	A	26	20/1	SPARE	0		
0		2667	*	–	27	B	28	20/1	SPARE	0		
0		2667	*	–	29	C	30	20/1	SPARE	0		
0		3000	SDB-6B,7B	20/3	31	A	32	20/1	SPACE	0		
0		3000	*	–	33	B	34	20/1	SPACE	0		
0		3000	*	–	35	C	36	20/1	SPACE	0		
0			SPACE	20/1	37	A	38	225/3	PANEL LP1	0	10080	23850
0			SPACE	20/1	39	B	40	–	VIA XFMR TLP1	0	10440	29368
0			SPACE	20/1	41	C	42	–	*	0	10080	30307

VA:L (LIGHTING)	0	CONNECTED	0	DEMAND
VA:R (RECEPTACLES)	30600	CONNECTED	20300	DEMAND
VA:O (OTHER)	204383	CONNECTED	204383	DEMAND
VA: TOTAL	234983	CONNECTED	224683	DEMAND
AMPS: TOTAL	283	CONNECTED	270	DEMAND

L	R	O		TOTAL			
0	10080	64136	VA CONNECTED TO A PHASE	74216	VA =	268	AMPS CONNECTED TO A PHASE @ 277 VOLTS
0	10440	69654	VA CONNECTED TO B PHASE	80094	VA =	289	AMPS CONNECTED TO B PHASE @ 277 VOLTS
0	10080	70593	VA CONNECTED TO C PHASE	80673	VA =	291	AMPS CONNECTED TO C PHASE @ 277 VOLTS
0	30600	204383	TOTAL	234983	VA		

PANELBOARD LP1 – Section 1

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
400 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND; ISOLATED GROUND — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	1080		RECEPTACLES	20/1	1	A	2	20/1	RECEPTACLES	0	720	
0	0	1524	ICE MACHINE	20/1	3	B	4	20/1	RECEPTACLES	0	720	
0	0	547	REFRIGERATOR	20/1	5	C	6	20/1	RECEPTACLES	0	720	
0	0	1725	HAND DRYER	20/1	7	A	8	20/1	RECEPTACLES	0	720	
0	0	1725	HAND DRYER	20/1	9	B	10	20/1	RECEPTACLES	0	360	
0	0	1725	HAND DRYER	20/1	11	C	12	20/1	RECEPTACLES	0	900	
0	720		RECEPTACLES	20/1	13	A	14	20/1	RECEPTACLES	0	720	
0	720		RECEPTACLES	20/1	15	B	16	20/1	RECEPTACLES	0	720	
0	720		RECEPTACLES	20/1	17	C	18	20/1	EWC	0	0	1200
0	720		RECEPTACLES	20/1	19	A	20	20/1	RECEPTACLES	0	1080	
0	720		RECEPTACLES	20/1	21	B	22	20/1	RECEPTACLES	0	720	
0	1080		RECEPTACLES	20/1	23	C	24	20/1	RECEPTACLES	0	720	
0	0	1200	EWC	20/1	25	A	26	20/1	RECEPTACLES	0	720	
0	900		RECEPTACLES	20/1	27	B	28	20/1	RECEPTACLES	0	900	
0	720		RECEPTACLES	20/1	29	C	30	20/1	RECEPTACLES	0	540	
0	0	3290	EUH-1	35/3	31	A	32	20/1	SPARE	0	0	
0	0	3290	*	–	33	B	34	20/1	SPARE	0	0	
0	0	3290	*	–	35	C	36	20/1	SPARE	0	0	
0	0	3290	EUH-2	35/3	37	A	38	20/1	SPACE	0	0	
0	0	3290	*	–	39	B	40	20/1	SPACE	0	0	
0	0	3290	*	–	41	C	42	20/1	SPACE	0	0	

PANELBOARD LP1 – Section 2

0	180		ELEVATOR RECEPTACLE	20/1	43	A	44	20/1	HAND DRYER	0	0	1725
0	0	864	ELEVATOR SUMP PUMP (ELSP-1)	20/1	45	B	46	20/1	HAND DRYER	0	0	1725
0	0	300	ELEVATOR CAB LIGHTS	20/1	47	C	48	20/1	HAND DRYER	0	0	1725
0	720		RECEPTACLES	20/1	49	A	50	20/1	RECEPTACLES	0	1080	
0	1080		RECEPTACLES	20/1	51	B	52	20/1	RECEPTACLES	0	0	500
0	360		RTU-A/B RECEPTACLES	20/1	53	C	54	20/1	RECEPTACLES	0	0	500
0	180		ACCU-1 RECEPTACLE	20/1	55	A	56	20/1	HAND DRYER	0	0	1500
0	0	696	EF-4,5	20/1	57	B	58	20/1	DOOR HARDWARE	0	0	360
0	0	696	EF-6,7	20/1	59	C	60	20/1	DOOR HARDWARE	0	0	360
0	0		SPARE	20/1	61	A	62	20/1	UNDERCOUNTER REF.	0	0	1800
0	0	5574	AHU-1	70/2	63	B	64	20/1	WH-2	0	180	
0	0	5574	*	–	65	C	66	20/1	WH-3	0	180	
0	0		ACCU-1*	40/2	67	A	68	20/1	WH-4	0	180	
0	0			–	69	B	70	20/1	WH-5	0	180	
0	0	1140	FCU-1/FCCU-1	20/2	71	C	72	20/1	HWCP-2	0	0	500
0	0	1140	*	–	73	A	74	20/1	HWCP-3	0	0	500
0	0	1140	FCU-2/FCCU-2	20/2	75	B	76	20/1	SPARE	0	0	
0	0	1140	*	–	77	C	78	20/1	SPARE	0	0	
0	0	5820	PANEL S1	200/3	79	A	80	100/3	PANEL LC1	0	1260	1860
0	0	5820		–	81	B	82	–	*	0	3240	2860
0	0	5820		–	83	C	84	–	*	0	4140	2500

*=NONCOINCIDENTAL LOAD.

VA:L (LIGHTING)	0	CONNECTED	0	DEMAND
VA:R (RECEPTACLES)	30600	CONNECTED	20300	DEMAND
VA:O (OTHER)	83525	CONNECTED	83525	DEMAND
VA: TOTAL	114125	CONNECTED	103825	DEMAND
AMPS: TOTAL	317	CONNECTED	288	DEMAND

L	R	O		TOTAL			
0	10080	23850	VA CONNECTED TO A PHASE	33930	VA =	283	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	10440	29368	VA CONNECTED TO B PHASE	39808	VA =	332	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	10080	30307	VA CONNECTED TO C PHASE	40387	VA =	337	AMPS CONNECTED TO C PHASE @ 120 VOLTS
0	30600	83525	TOTAL	114125	VA		

PANELBOARD LC1

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
100 A MAIN LUGS ONLY — MOUNTING: SURFACE
BUSES: MAIN – 100 A; NEUTRAL – 200%; EQUIPMENT GROUND; ISOLATED GROUND; SPD PANELBOARD — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	360		COMPUTERS	20/1	1	A	2	20/1	IT 116	0	0	500
0	720		COMPUTERS	20/1	3	B	4	20/1	IT 116	0	0	500
0	720		COMPUTERS	20/1	5	C	6	30/1	IT 116 L5-30R	0	0	2000
0	0		PRINTER	20/1	7	A	8	20/1	IT 116	0	0	500
0	720		COMPUTERS	20/1	9	B	10	30/1	IT 116 L5-30R	0	0	2000
0	360		COMPUTERS	20/1	11	C	12	20/1	IT 116	0	0	500
0	0		COMPUTERS	20/1	13	A	14	20/1	IT 116	0	0	360
0	0	360	FACP	20/1	15	B	16	20/1	COMPUTERS	0	360	
0	720		COMPUTERS	20/1	17	C	18	20/1	COMPUTERS	0	720	
0	540		COMPUTERS	20/1	19	A	20	20/1	COMPUTERS	0	360	
0	360		COMPUTERS	20/1	21	B	22	20/1	COMPUTERS	0	360	
0	720		COMPUTERS	20/1	23	C	24	20/1	COMPUTERS	0	180	
0	0	500	PRINTER	20/1	25	A	26	20/1	SPARE	0	0	
0	720		COMPUTERS	20/1	27	B	28	20/1	SPARE	0	0	
0	720		COMPUTERS	20/1	29	C	30	20/1	SPARE	0	0	
0	0		SPARE	20/1	31	A	32	20/1	SPACE	0	0	
0	0		SPARE	20/1	33	B	34	20/1	SPACE	0	0	
0	0		SPARE	20/1	35	C	36	20/1	SPACE	0	0	
0	0		SPACE	20/1	37	A	38	30/3	SURGE PROTECTIVE DEVICE	0	0	
0	0		SPACE	20/1	39	B	40	–	*	0	0	
0	0		SPACE	20/1	41	C	42	–	*	0	0	

VA:L (LIGHTING)	0	CONNECTED	0	DEMAND
VA:R (RECEPTACLES)	8640	CONNECTED	8640	DEMAND
VA:O (OTHER)	7220	CONNECTED	7220	DEMAND
VA: TOTAL	15860	CONNECTED	15860	DEMAND
AMPS: TOTAL	44	CONNECTED	44	DEMAND

L	R	O		TOTAL			
0	1260	1860	VA CONNECTED TO A PHASE	3120	VA =	26	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	3240	2860	VA CONNECTED TO B PHASE	6100	VA =	51	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	4140	2500	VA CONNECTED TO C PHASE	6640	VA =	55	AMPS CONNECTED TO C PHASE @ 120 VOLTS
0	8640	7220	TOTAL	15860	VA		

PANELBOARD S1

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
200A MAIN CIRCUIT BREAKER — MOUNTING: NEMA 3R
BUSES: MAIN – 225 A; NEUTRAL – 200%; EQUIPMENT GROUND; ISOLATED GROUND; SPD PANELBOARD — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	5820	MONUMENT SIGN	70/3	1	A	2	70/3	MONUMENT SIGN	0	0	
0	0	5820	*	–	3	B	4	–	*	0	0	
0	0	5820	*	–	5	C	6	–	*	0	0	
0	0		SPARE	20/1	7	A	8	20/1	SPARE	0	0	
0	0		SPARE	20/1	9	B	10	20/1	SPARE	0	0	
0	0		SPARE	20/1	11	C	12	20/1	SPARE	0	0	
0	0		SPARE	20/1	13	A	14	20/1	SPARE	0	0	
0	0		SPARE	20/1	15	B	16	20/1	SPARE	0	0	
0	0		SPARE	20/1	17	C	18	20/1	SPARE	0	0	
0	0		SPARE	20/1	19	A	20	20/1	SPARE	0	0	
0	0		SPARE	20/1	21	B	22	20/1	SPARE	0	0	
0	0		SPARE	20/1	23	C	24	20/1	SPARE	0	0	
0	0		SPARE	20/1	25	A	26	20/1	SPARE	0	0	
0	0		SPARE	20/1	27	B	28	20/1	SPARE	0	0	
0	0		SPARE	20/1	29	C	30	20/1	SPARE	0	0	
0	0		SPACE	20/1	31	A	32	20/1	SPACE	0	0	
0	0		SPACE	20/1	33	B	34	20/1	SPACE	0	0	
0	0		SPACE	20/1	35	C	36	20/1	SPACE	0	0	
0	0		SPACE	20/1	37	A	38	30/3	INTEGRAL SURGE PROTECTION	0	0	
0	0		SPACE	20/1	39	B	40	–	*	0	0	
0	0		SPACE	20/1	41	C	42	–	*	0	0	

VA:L (LIGHTING)	0	CONNECTED	0	DEMAND
VA:R (RECEPTACLES)	0	CONNECTED	0	DEMAND
VA:O (OTHER)	17460	CONNECTED	17460	DEMAND
VA: TOTAL	17460	CONNECTED	17460	DEMAND
AMPS: TOTAL	48	CONNECTED	48	DEMAND

L	R	O		TOTAL			
0	0	5820	VA CONNECTED TO A PHASE	5820	VA =	49	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	0	5820	VA CONNECTED TO B PHASE	5820	VA =	49	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	0	5820	VA CONNECTED TO C PHASE	5820	VA =	49	AMPS CONNECTED TO C PHASE @ 120 VOLTS
0	0	17460	TOTAL	17460	VA		

A ELECTRICAL PANEL SCHEDULES
SCALE: N.T.S.

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT 971805
DATE 06/07/2019
REVISED

E4.01
ELECTRICAL PANEL SCHEDULES

PANELBOARD M2

VOLTAGE: 480Y/277 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
400 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND — Isc = 22,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
2459			LIGHTING	20/1	1	A	2	60/3	RTU-C	0		10420
315			LIGHTING	20/1	3	B	4	–	*	0		10420
90			LIGHTING	20/1	5	C	6	–	*	0		10420
0		554	HVLS-1,2	20/3	7	A	8	30/3	SDB-1C,2C,3C	0		4167
0		554	*	–	9	B	10	–	*	0		4167
0		554	*	–	11	C	12	–	*	0		4167
0			SPARE	20/1	13	A	14	20/3	SDB-4C,5C,6C	0		3167
0			SPARE	20/1	15	B	16	–	*	0		3167
0			SPARE	20/1	17	C	18	–	*	0		3167
0			SPARE	20/1	19	A	20	30/3	SDB-7C,8C,9C	0		4000
0			SPARE	20/1	21	B	22	–	*	0		4000
0			SPARE	20/1	23	C	24	–	*	0		4000
0			SPARE	20/1	25	A	26	20/1	SPARE	0		
0			SPARE	20/1	27	B	28	20/1	SPARE	0		
0			SPARE	20/1	29	C	30	20/1	SPARE	0		
0			SPACE	20/1	31	A	32	20/1	SPACE	0		
0			SPACE	20/1	33	B	34	20/1	SPACE	0		
0			SPACE	20/1	35	C	36	20/1	SPACE	0		
0			SPACE	20/1	37	A	38	225/3	PANEL LP2	1340	5940	21448
0			SPACE	20/1	39	B	40	–	VIA XFMR TLP2	1190	4500	24789
0			SPACE	20/1	41	C	42	–	*	1190	6480	23590

VA:L (LIGHTING)	6584	CONNECTED	8230 DEMAND
VA:R (RECEPTACLES)	16920	CONNECTED	13460 DEMAND
VA:O (OTHER)	136751	CONNECTED	136751 DEMAND
VA: TOTAL	160255	CONNECTED	158441 DEMAND
AMPS: TOTAL	193	CONNECTED	191 DEMAND

L	R	O		TOTAL			
3799	5940	43756	VA CONNECTED TO A PHASE	53495	VA =	193	AMPS CONNECTED TO A PHASE @ 277 VOLTS
1505	4500	47097	VA CONNECTED TO B PHASE	53102	VA =	192	AMPS CONNECTED TO B PHASE @ 277 VOLTS
1280	6480	45898	VA CONNECTED TO C PHASE	53658	VA =	194	AMPS CONNECTED TO C PHASE @ 277 VOLTS
6584	16920	136751	TOTAL	160255	VA		

PANELBOARD LP2 – Section 1

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
400 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 400 A; NEUTRAL – 100%; EQUIPMENT GROUND; ISOLATED GROUND; SPD PANELBOARD — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	1080		RECEPTACLES	20/1	1	A	2	20/1	EWC	0	0	1200
0	0	500	RECEPTACLES	20/1	3	B	4	20/1	EWC	0	0	1200
0	0	500	RECEPTACLES	20/1	5	C	6	20/1	MOTORIZED SCREEN	0	0	500
0	0	500	RECEPTACLES	20/1	7	A	8	20/1	RECEPTACLES	0	900	
0	0	500	RECEPTACLES	20/1	9	B	10	20/1	RECEPTACLES	0	360	
0	0	500	RECEPTACLES	20/1	11	C	12	20/1	COMPUTERS	0	720	
0	0	1000	RECEPTACLES	20/1	13	A	14	20/1	COMPUTERS	0	180	
0	0	1000	RECEPTACLES	20/1	15	B	16	20/1	COMPUTERS	0	720	
0	0	1000	RECEPTACLES	20/1	17	C	18	20/1	RECEPTACLES	0	720	
0	0	1000	RECEPTACLES	20/1	19	A	20	20/1	RECEPTACLES	0	720	
0	720		RECEPTACLES	20/1	21	B	22	20/1	COMPUTERS	0	360	
0	1080		RECEPTACLES	20/1	23	C	24	20/1	HAND DRYER	0	0	1725
0	1080		RECEPTACLES	20/1	25	A	26	20/1	DIVING POOL LIGHTING	840	0	
0	0	1725	HAND DRYER	20/1	27	B	28	20/1	50 POOL LIGHTING	1190	0	
0	0	1725	HAND DRYER	20/1	29	C	30	20/1	50 POOL LIGHTING	1190	0	
0	0	3290	EUH-3	35/3	31	A	32	20/1	TIMING SYS RECETACLES	0	720	
0	0	3290	*	–	33	B	34	20/1	SPARE	0	0	
0	0	3290	*	20/1	35	C	36	20/1	SPARE	0	0	
0	0		SPACE	20/1	37	A	38	20/1	SPACE	0	0	
0	0		SPACE	20/1	39	B	40	20/1	SPACE	0	0	
0	0		SPACE	20/1	41	C	42	20/1	SPACE	0	0	

PANELBOARD LP2 – Section 2

0	180		RTU-C RECEPTACLE	20/1	43	A	44	20/1	ENDLESS POOL LIGHTING	500	0	
0	540		WHEEL CHAIR RECEPTACLES	20/1	45	B	46	20/1	RETRACTABLE BLEACHERS	0	0	1920
0	540		WHEEL CHAIR RECEPTACLES	20/1	47	C	48	20/1	RETRACTABLE BLEACHERS	0	0	1920
0	540		WHEEL CHAIR RECEPTACLES	20/1	49	A	50	20/1	RETRACTABLE BLEACHERS	0	0	1920
0	0		SPARE	20/1	51	B	52	20/1	WH-1	0	180	
0	0		SPARE	20/1	53	C	54	20/1	HWCP-1	0	0	500
0	0		SPARE	20/1	55	A	56	20/1	SPARE	0	0	
0	720		RECEPTACLES	20/1	57	B	58	20/1	SPARE	0	0	
0	1080		RECEPTACLES	20/1	59	C	60	20/1	SPARE	0	0	
0	540		RECEPTACLES	20/1	61	A	62	20/1	SPARE	0	0	
0	900		RECEPTACLES	20/1	63	B	64	20/1	EF-10	0	0	696
0	900		RECEPTACLES	20/1	65	C	66	20/1	EF-11,12	0	0	1392
0	0		RECEPTACLES	20/1	67	A	68	20/2	EWH-1	0	0	1500
0	0		RECEPTACLES	20/1	69	B	70	–	*	0	0	1500
0	0		RECEPTACLES	20/1	71	C	72	20/1	TIMING SYS RECETACLES	0	1440	
0	0		SPACE	20/1	73	A	74	20/1	SPACE	0	0	
0	0		SPACE	20/1	75	B	76	20/1	SPACE	0	0	
0	0		SPACE	20/1	77	C	78	20/1	SPACE	0	0	
0	0		SURGE PROTECTIVE DEVICE	30/3	79	A	80	225/3	PANEL LC2	0	0	11038
0	0		*	–	81	B	82	–	*	0	0	12458
0	0		*	–	83	C	84	–	*	0	0	10538

VA:L (LIGHTING)	3720	CONNECTED	4650 DEMAND
VA:R (RECEPTACLES)	16920	CONNECTED	13460 DEMAND
VA:O (OTHER)	69827	CONNECTED	69827 DEMAND
VA: TOTAL	90467	CONNECTED	87937 DEMAND
AMPS: TOTAL	251	CONNECTED	244 DEMAND

L	R	O		TOTAL			
1340	5940	21448	VA CONNECTED TO A PHASE	28728	VA =	239	AMPS CONNECTED TO A PHASE @ 120 VOLTS
1190	4500	24789	VA CONNECTED TO B PHASE	30479	VA =	254	AMPS CONNECTED TO B PHASE @ 120 VOLTS
1190	6480	23590	VA CONNECTED TO C PHASE	31260	VA =	261	AMPS CONNECTED TO C PHASE @ 120 VOLTS
3720	16920	69827	TOTAL	90467	VA		

PANELBOARD LC2

VOLTAGE: 208Y/120 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
225 A MAIN LUGS ONLY — MOUNTING: SURFACE
BUSES: MAIN – 225A; NEUTRAL – 200%; EQUIPMENT GROUND; ISOLATED GROUND; SPD PANELBOARD — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	500	COMPUTERS	20/1	1	A	2	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	3	B	4	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	5	C	6	30/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	7	A	8	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	9	B	10	30/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	11	C	12	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	13	A	14	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	15	B	16	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	17	C	18	20/1	SCORE BOARD	0	0	1042
0	0	500	COMPUTERS	20/1	19	A	20	20/1	SCORE BOARD	0	0	1042
0	0	1920	COMPUTERS	20/1	21	B	22	20/1	SCORE BOARD	0	0	1042
0	0	1920	COMPUTERS	20/1	23	C	24	20/1	SCORE BOARD	0	0	1042
0	0	1920	COMPUTERS	20/1	25	A	26	20/1	SCORE BOARD	0	0	1475
0	0	1920	COMPUTERS	20/1	27	B	28	20/1	SCORE BOARD	0	0	1475
0	0		SPARE	20/1	29	C	30	20/1	SCORE BOARD	0	0	1475
0	0		SPARE	20/1	31	A	32	20/1	SCORE BOARD	0	0	1475
0	0		SPARE	20/1	33	B	34	20/1	SCORE BOARD	0	0	1475
0	0		SPARE	20/1	35	C	36	20/1	SCORE BOARD	0	0	1475
0	0		SPACE	20/1	37	A	38	30/3	SURGE PROTECTIVE DEVICE	0	0	
0	0		SPACE	20/1	39	B	40	–	*	0	0	
0	0		SPACE	20/1	41	C	42	–	*	0	0	

VA:L (LIGHTING)	0	CONNECTED	0 DEMAND
VA:R (RECEPTACLES)	0	CONNECTED	0 DEMAND
VA:O (OTHER)	34034	CONNECTED	34034 DEMAND
VA: TOTAL	34034	CONNECTED	34034 DEMAND
AMPS: TOTAL	94	CONNECTED	94 DEMAND

L	R	O		TOTAL			
0	0	11038	VA CONNECTED TO A PHASE	11038	VA =	92	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	0	12458	VA CONNECTED TO B PHASE	12458	VA =	104	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	0	10538	VA CONNECTED TO C PHASE	10538	VA =	88	AMPS CONNECTED TO C PHASE @ 120 VOLTS
0	0	34034	TOTAL	34034	VA		

PANELBOARD M3 – Section 1

VOLTAGE: 480Y/277 VOLT 3 PHASE 4 WIRE — LOCATION: ROOM
600 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 600 A; NEUTRAL – 100%; EQUIPMENT GROUND; ISOLATED GROUND; SPD PANELBOARD — Isc = 22,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
1384			LIGHTING	20/1	1	A	2	35/3	RTU-D	0		6429
0			SPARE	20/1	3	B	4	–	*	0		6429
0			SPARE	20/1	5	C	6	–	*	0		6429
0		11085	RECIRCULATING PUMP PP1	80/3	7	A	8	40/3	PAFC-1	0		7981
0		11085	*	–	9	B	10	–	*	0		7981
0		11085	*	–	11	C	12	–	*	0		7981
0		11085	RECIRCULATING PUMP PP2	80/3	13	A	14	40/3	PAFC-2	0		7981
0		11085	*	–	15	B	16	–	*	0		7981
0		11085	*	–	17	C	18	–	*	0		7981
0		11085	RECIRCULATING PUMP PP3	80/3	19	A	20	25/3	PAFC-3	0		4212
0		11085	*	–	21	B	22	–	*	0		4212
0		11085	*	–	23	C	24	–	*	0		4212
0		11085	RECIRCULATING PUMP PP4	80/3	25	A	26	20/1	SPACE	0		
0		11085	*	–	27	B	28	20/1	SPACE	0		
0		11085	*	–	29	C	30	20/1	SPACE	0		
0			SPARE	20/1	31	A	32	20/1	SPACE	0		
0			SPARE	20/1	33	B	34	20/1	SPACE	0		
0			SPARE	20/1	35	C	36	20/1	SPACE	0		
0			SPACE	20/1	37	A	38	125/2	PANEL SP1	0	2880	16920
0			SPACE	20/1	39	B	40	–	VIA XFMR TSP1	0	3060	14468
0			SPACE	20/1	41	C	42	20/1	SPARE	0		

PANELBOARD M3 – Section 2

0			SPARE	20/1	43	A	44	50/3	COMP. POOL UV SYSTEM	0		4000
0			SPARE	20/1	45	B	46	–	*	0		4000
0			SPARE	20/1	47	C	48	–	*	0		4000
0			SPARE	20/1	49	A	50	50/3	DIVE POOL UV SYSTEM	0		4000
0			SPARE	20/1	51	B	52	–	*	0		4000
0			SPARE	20/1	53	C	54	–	*	0		4000
0			SPARE	20/1	55	A	56	20/1	SPARE	0		
0			SPARE	20/1	57	B	58	20/1	SPARE	0		
0			SPARE	20/1	59	C	60	20/1	SPARE	0		
0			SPACE	20/1	61	A	62	20/1	SPACE	0		
0			SPACE	20/1	63	B	64	20/1	SPACE	0		
0			SPACE	20/1	65	C	66	20/1	SPACE	0		
0			SPACE	20/1	67	A	68	20/1	SPACE	0		
0			SPACE	20/1	69	B	70	20/1	SPACE	0		
0			SPACE	20/1	71	C	72	20/1	SPACE	0		
0			SPACE	20/1	73	A	74	20/1	SPACE	0		
0			SPACE	20/1	75	B	76	20/1	SPACE	0		
0			SPACE	20/1	77	C	78	20/1	SPACE	0		
0			SPACE	20/1	79	A	80	30/3	SURGE PROTECTIVE DEVICE	0		
0			SPACE	20/1	81	B	82	–	*	0		
0			SPACE	20/1	83	C	84	–	*	0		

VA:L (LIGHTING)	1384	CONNECTED	1730 DEMAND
VA:R (RECEPTACLES)	5940	CONNECTED	5940 DEMAND
VA:O (OTHER)	268217	CONNECTED	268217 DEMAND
VA: TOTAL	275541	CONNECTED	275887 DEMAND
AMPS: TOTAL	331	CONNECTED	332 DEMAND

L	R	O		TOTAL			
1384	2880	95863	VA CONNECTED TO A PHASE	100127	VA =	361	AMPS CONNECTED TO A PHASE @ 277 VOLTS
0	3060	93411	VA CONNECTED TO B PHASE	96471	VA =	348	AMPS CONNECTED TO B PHASE @ 277 VOLTS
0	0	78943	VA CONNECTED TO C PHASE	78943	VA =	285	AMPS CONNECTED TO C PHASE @ 277 VOLTS
1384	5940	268217	TOTAL	275541	VA		

PANELBOARD SP1

VOLTAGE: 120/240 VOLT 1 PHASE 3 WIRE — LOCATION: ROOM
200 A MAIN CIRCUIT BREAKER — MOUNTING: SURFACE
BUSES: MAIN – 225 A; 100% NEUTRAL: EQUIPMENT GROUND; SPD PANELBOARD — Isc = 10,000 A RMS SYM AVAILABLE

VA:L	VA:R	VA:O	LOAD	BKR	CKT	PH	CKT	BKR	LOAD	VA:L	VA:R	VA:O
0	0	1440	AGITATOR PUMP PP5	25/2	1	A	2	20/1	IRRIGATION CONTROLLER	0	0	360
0	0	1440	*	–	3	B	4	20/1	PAFC RECEPTACLES	0	720	
0	0	500	COMP POOL FILTER SYSTEM	20/1	5	A	6	20/1	RTU-D RECEPTACLE	0	180	
0	0	500	COMP POOL CHEMICAL CONTROLLER	20/1	7	B	8	20/1	RECEPTACLES	0	720	
0	0	500	COMP POOL CHLORINATION SYSTEM	20/1	9	A	10	20/1	RECEPTACLES	0	900	
0	0	500	COMP POOL WATER LEVEL CONTROLLER	20/1	11	B	12	20/1	SPARE	0	0	
0	0	500	COMP POOL HEATER	20/1	13	A	14	20/1	COMPUTERS	0	360	
0	0	500	DIVE POOL FILTER SYSTEM	20/1	15	B	16	20/1	WH-6	0	180	
0	0	500	DIVE POOL CHEMICAL CONTROLLER	20/1	17	A	18	20/1	HWCP-4	0	0	500
0	0	500	DIVE POOL CHLORINATION SYSTEM	20/1	19	B	20	20/1	ACID ROOM	0	720	
0	0	500	DIVE POOL WATER LEVEL CONTROLLER	20/1	21	A	22	20/1	CALCIUM HYPO ROOM	0	720	
0	0	300	DIVE POOL HEATER	20/1	23	B	24	20/1	POOL EQ. YARD	0	720	
0	0	500	ENDLESS POOL FILTER SYSTEM	20/1	25	A	26	30/2	ENDLESS POOL HEATER	0	0	2750
0	0	500	ENDLESS POOL CHEMICAL CONTROLLER	20/1	27	B	28	–	*	0	0	2750
0	0	500	ENDLESS POOL CHLORINATION SYSTEM	20/1	29	A	30	20/2	ENDLESS POOL UV SYSTEM	0	0	650
0	0	500	ENDLESS POOL WATER LEVEL CONTROLLER	20/1	31	B	32	–	*	0	0	650
0	0	1440	ENDLESS PUMP	25/2	33	A	34	40/2	SWIM CURRENT POWER UNIT	0	0	2800
0	0	1440	*	–	35	B	36	–	*	0	0	2800
0	0	1440	HYDROTHERAPY PUMP	25/2	37	A	38	20/2	SUBMERSIBLE PUMP	0	0	648
0	0	1440	*	–	39	B	40	–	*	0	0	648
0	720		POOL EQ. YARD	20/1	41	A	42	20/1	EF-14,15	0	0	1392
0	0		SPARE	20/1	43	B	44	20/1	SPARE	0	0	
0	0		SPARE	20/1	45	A	46	20/1	SPARE	0	0	
0	0		SPARE	20/1	47	B	48	20/1	SPARE	0	0	
0	0		SPARE	20/1	49	A	50	20/1	SPARE	0	0	
0	0		SPARE	20/1	51	B	52	20/1	SPARE	0	0	
0	0		SPARE	20/1	53	A	54	20/1	SPARE	0	0	
0	0		SPARE	20/1	55	B	56	20/1	SPARE	0	0	
0	0		SPACE	20/1	57	A	58	20/1	SPACE	0	0	
0	0		SPACE	20/1	59	B	60	20/1	SPACE	0	0	
0	0		SPACE	20/1	61	A	62	20/1	SPACE	0	0	
0	0		SPACE	20/1	63	B	64	20/1	SPACE	0	0	
0	0		SPACE	20/1	65	A	66	20/1	SPACE	0	0	
0	0		SPACE	20/1	67	B	68	20/1	SPACE	0	0	
0	0		SPACE	20/1	69	A	70	20/1	SPACE	0	0	
0	0		SPACE	20/1	71	B	72	20/1	SPACE	0	0	
0	0		SPACE	20/1	73	A	74	20/1	SPACE	0	0	
0	0		SPACE	20/1	75	B	76	20/1	SPACE	0	0	
0	0		SPACE	20/1	77	A	78	20/1	SPACE	0	0	
0	0		SPACE	20/1	79	B	80	20/1	SPACE	0	0	
0	0		SPACE	20/1	81	A	82	30/2	SURGE PROTECTIVE DEVICE	0	0	
0	0		SPACE	20/1	83	B	84	–	*	0	0	

VA:L (LIGHTING)	0	CONNECTED	0 DEMAND
VA:R (RECEPTACLES)	5940	CONNECTED	5940 DEMAND
VA:O (OTHER)	31388	CONNECTED	31388 DEMAND
VA: TOTAL	37328	CONNECTED	37328 DEMAND
AMPS: TOTAL	156	CONNECTED	156 DEMAND

L	R	O		TOTAL			
0	2880	16920	VA CONNECTED TO A PHASE	19800	VA =	165	AMPS CONNECTED TO A PHASE @ 120 VOLTS
0	3060	14468	VA CONNECTED TO B PHASE	17528	VA =	146	AMPS CONNECTED TO B PHASE @ 120 VOLTS
0	5940	31388	TOTAL	37328	VA		

A ELECTRICAL PANEL SCHEDULES
SCALE: N.T.S.

THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

STATE OF TEXAS
ABRAM DOMINGUEZ
97393
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

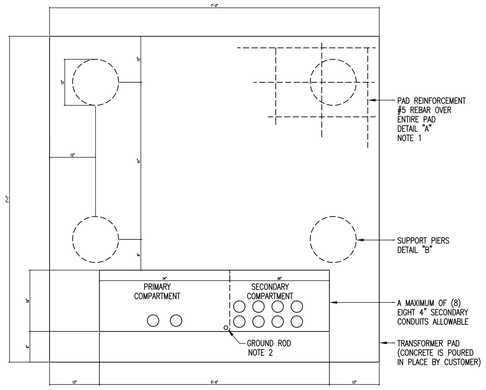
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

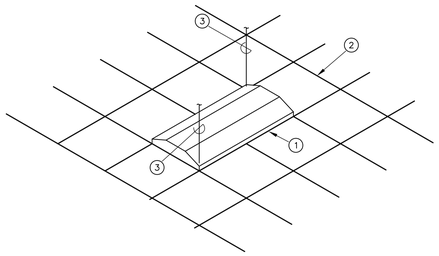
MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PROJECT 971805
DATE 06/07/2019
REVISED

E4.02
ELECTRICAL PANEL SCHEDULES



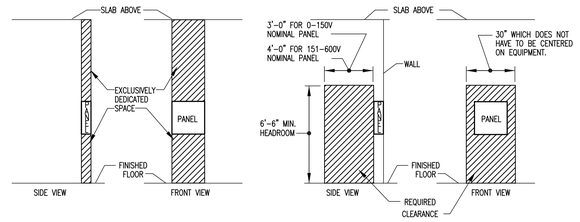
A CON.PAD AND PIERS DOR THREE PHASE PAD MOUNTED TRANSFORMER
SCALE: N.T.S.



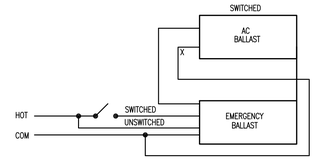
NOTES BY SYMBOL " ◯ "

1. 2'x 4' LAY-IN FLUORESCENT FIXTURE
2. SUSPENDED CEILING
3. TIE WIRE, CONNECT TO TWO CORNERS OF FIXTURE TO STRUCTURE ABOVE, INDEPENDENT OF CEILING SUPPORTS.

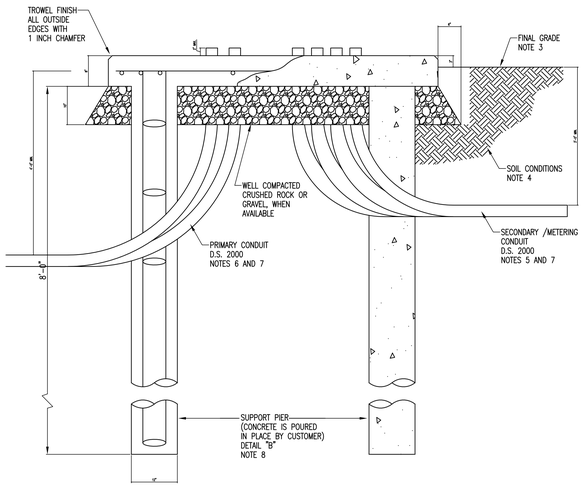
B TYPICAL LAY-IN FIXTURE SUPPORT
SCALE: N.T.S.

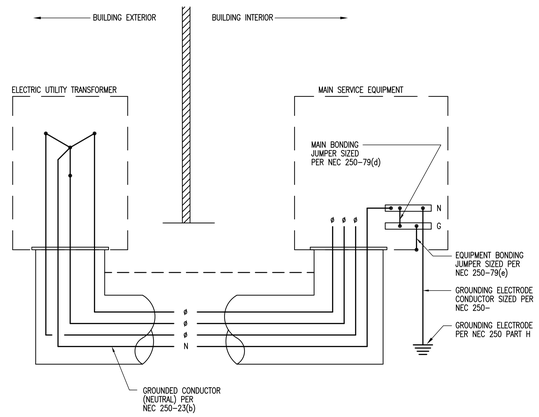


C TYPICAL PANELBOARD REQUIRED CLEARANCE
SCALE: N.T.S.

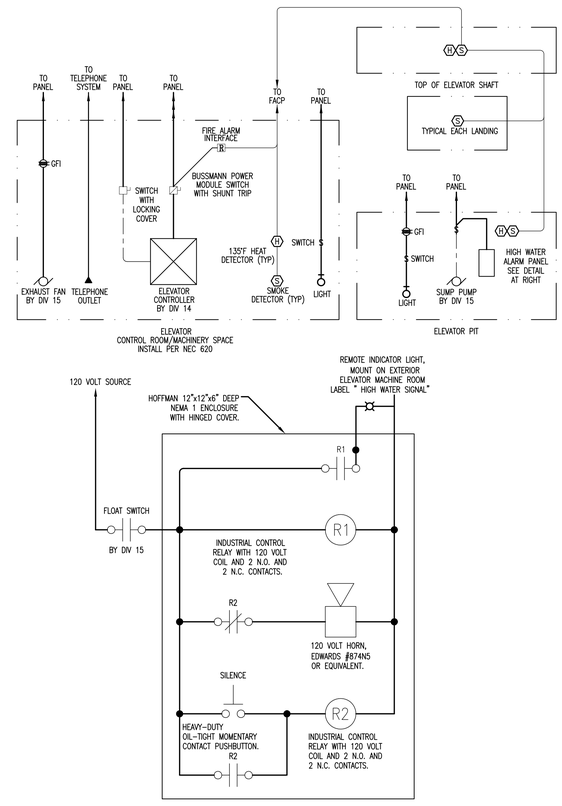


D EMERGENCY BALLAST WIRING DETAIL
SCALE: N.T.S.

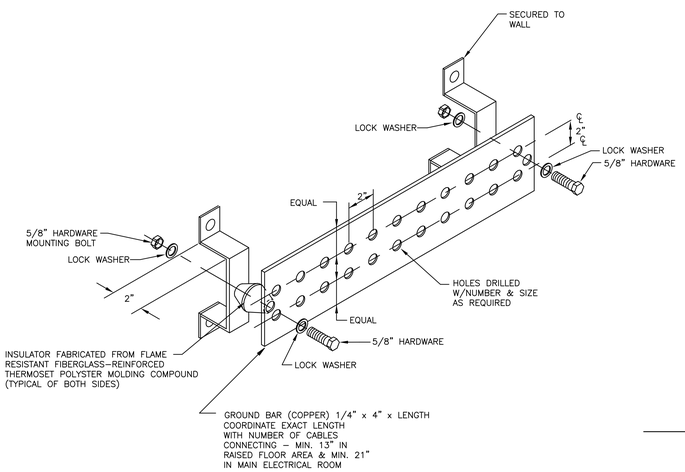




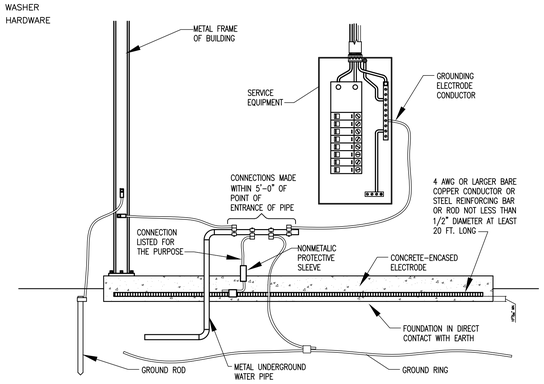
E SERVICE ENTRANCE (MAIN SWITCHBOARD) GROUNDING DETAIL
SCALE: N.T.S.



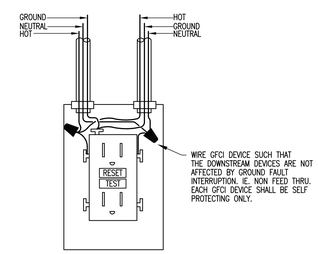
F ELEVATOR PIT HIGH WATER ALARM ELECTRICAL SCHEMATIC
SCALE: N.T.S.



G WALL MOUNTED SINGLE-POINT GROUND BAR DETAIL
SCALE: N.T.S.



H GROUNDED ELECTRODE SYSTEM DETAIL
SCALE: N.T.S.



I GFCI RECEPTACLE – WIRING DIAGRAM
SCALE: N.T.S.

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

E5.01
ELECTRICAL DETAILS

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

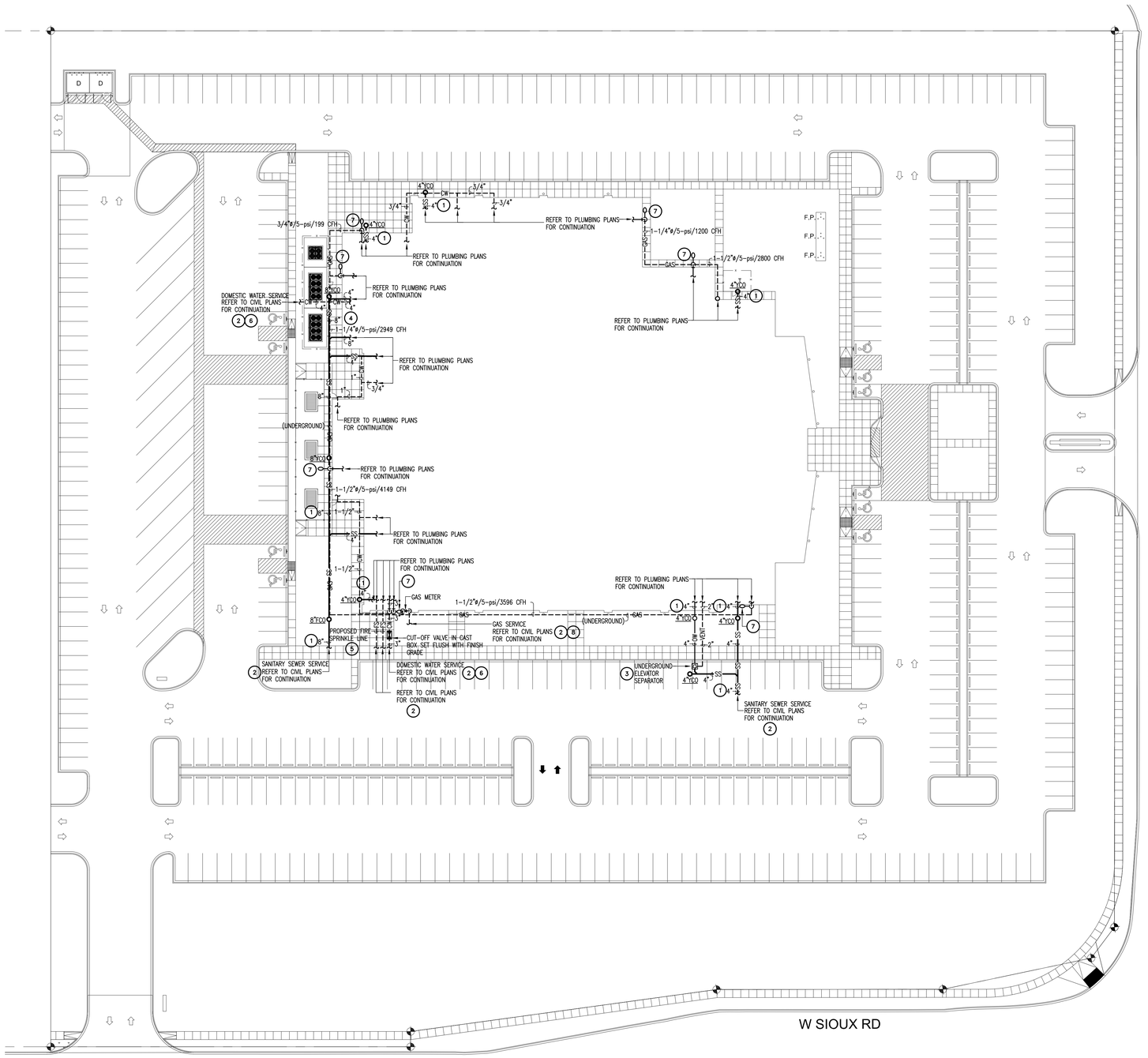
GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPTANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

KEYED NOTES:○

1. PROPOSED SEWER LINE. REFER TO CIVIL PLAN FOR EXACT LOCATION.
2. PLUMBING CONTRACTOR SHALL VERIFY POINT OF CONNECTION TO UTILITIES PRIOR TO BID TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.
3. OUTDOOR UNDERGROUND ELEVATOR SEPERATOR EQUAL TO PARK MODEL "ESC-100". REFER TO ELEVATOR SUMP PUMP DIAGRAM.
4. WATER LINE FOR POOL. REFER TO PLUMBING PLAN FOR CONTINUATION.
5. PROPOSED FIRE SPRINKLER SUPPLY LINE. FIRE DEPARTMENT CONNECTION AND PIPE SHALL BE SIZED BY A LICENSED FIRE SPRINKLER DESIGNER. DESIGNER SHALL COORDINATE WITH ALL OTHER TRADES FOR WATER SUPPLY LINE REQUIREMENTS AND FIRE DEPARTMENT CONNECTION TO MEET CITY INSTALLATION REQUIREMENTS.
6. PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER LINE SIZE, AND POINT OF CONNECTION WITH CIVIL PLANS PRIOR TO BID TO AVOID CONFLICTS. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.
7. EACH GAS REGULATOR SHALL BE FURNISHED WITH A SHUT-OFF VALVE UP-STREAM OF REGULATOR.
8. CONNECT TO METERED GAS SERVICE PROVIDED BY GAS COMPANY. COORDINATE ROUTING AND POINT OF CONNECTION WITH GAS COMPANY PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT. LINE SHALL SIZED FOR A GAS LOAD OF XXX CFH.

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH EXISTING CONDITIONS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.



A PLUMBING SITE PLAN
SCALE: 1" = 30'-0"

NORTH

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

P1.00
PLUMBING SITE PLAN

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH EXISTING CONDITIONS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

KITCHEN EQUIPMENT WILL BE PROVIDED BY OTHERS. IT IS THE PLUMBING CONTRACTOR'S RESPONSIBILITY TO MAKE ALL FINAL CONNECTIONS TO EQUIPMENT.

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, STATE CODES AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

(C) PLUMBING CONTRACTOR SHALL TERMINATE ALL WATER ROUGH-IN WITH SHUT-OFF VALVES BEFORE CONNECTING TO EQUIPMENT AND RELATED FIXTURES.

(D) PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

(E) INSULATE "P" TRAPS AND SUPPLIES AT HANDICAP LAVATORIES WITH INSULATION KIT.

(F) PROVIDE VACUUM BREAKER TO ALL FIXTURES WITH HOSE CONNECTION AND APPLIANCES WITH DIRECT CONNECTIONS TO DOMESTIC WATER.

(G) REFER TO ARCHITECTS DRAWINGS FOR MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES

(H) PROVIDE CEILING ACCESS PANEL FOR WATER ISOLATION VALVES, IN OTHERWISE INACCESSIBLE AREAS. PROVIDE LOCKABLE HINGED ACCESS PANELS IN PUBLIC AREAS. PAINT PANELS TO MATCH SURROUNDING SURFACE.

(I) SAW CUT EXISTING SLAB AS REQUIRED TO ACCOMODATE NEW PLUMBING FIXTURE ROUGH-IN.

(J) ALL VENTS THROUGH ROOF SHALL BE FLASHED A MINIMUM OF 12" ABOVE ROOF. ALL VENTS SHALL BE MINIMUM OF 10' AWAY FROM ANY OUTSIDE AIR INTAKE.

KEY NOTES: ○

1. PROVIDE TRAP PRIMER CONNECTION FROM NEAREST FLUSH VALVE TRAP PRIMER, REFER TO DETAIL.
2. REFER TO HW/CW FLOOR PLAN FOR CONTINUATION OF PRIMER LINE AND TRAP PRIMER LOCATION ABOVE CEILING.
3. RISE CONDENSATE DRAIN LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL.
4. RISE SEWER LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
5. RISE VENT LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
6. RISE STORM SEWER UP TO HIGHER LEVEL.
7. COORDINATE HUB DRAIN LOCATION AND REQUIREMENTS WITH MECHANICAL CONTRACTOR FOR FINAL EQUIPMENT LOCATIONS PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.
8. PROVIDE AND INSTALL FIRE RATED ACCESS DOOR EQUAL TO A ELM MODEL "FR-16x16"; DOOR SHALL SERVICE HUB DRAIN, REFER TO DETAIL.
9. PROVIDE AND INSTALL ¾" COPPER CONDENSATE DRAIN LINE FROM UNIT TO HUB DRAIN. REFER TO DETAIL.

REFER TO PLUMBING SITE PLAN FOR CONTINUATION

REFER TO PLUMBING SITE PLAN FOR CONTINUATION

REFER TO PLUMBING SITE PLAN FOR CONTINUATION

A PLUMBING SEWER FLOOR PLAN
SCALE: 3/32" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

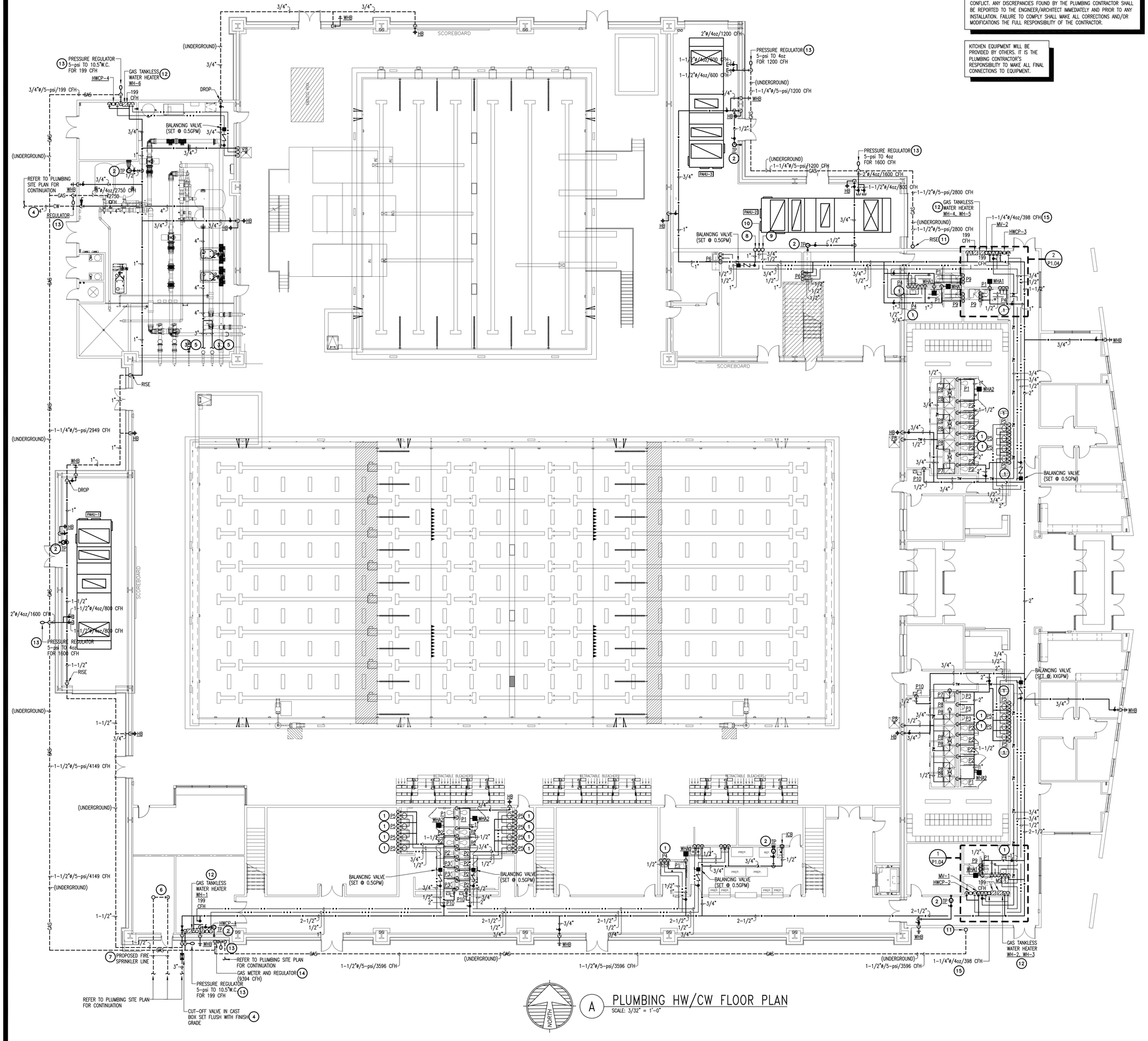
CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

P1.01
PLUMBING SEWER FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A PLUMBING HW/CW FLOOR PLAN
SCALE: 3/32" = 1'-0"

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, STATE CODES AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

(C) PLUMBING CONTRACTOR SHALL TERMINATE ALL WATER ROUGH-IN WITH SHUT-OFF VALVES BEFORE CONNECTING TO EQUIPMENT AND RELATED FIXTURES.

(D) PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

(E) INSULATE "P" TRAPS AND SUPPLIES AT HANDICAP LAVATORIES WITH INSULATION KIT.

(F) PROVIDE VACUUM BREAKER TO ALL FIXTURES WITH HOSE CONNECTION AND APPLIANCES WITH DIRECT CONNECTIONS TO DOMESTIC WATER.

(G) REFER TO ARCHITECTS DRAWINGS FOR MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES

(H) PROVIDE CEILING ACCESS PANEL FOR WATER ISOLATION VALVES, IN OTHERWISE INACCESSIBLE AREAS. PROVIDE LOCKABLE HINGED ACCESS PANELS IN PUBLIC AREAS. PAINT PANELS TO MATCH SURROUNDING SURFACE.

(I) SAW CUT EXISTING SLAB AS REQUIRED TO ACCOMODATE NEW PLUMBING FIXTURE ROUGH-IN.

(J) ALL VENTS THROUGH ROOF SHALL BE FLASHED A MINIMUM OF 12" ABOVE ROOF. ALL VENTS SHALL BE MINIMUM OF 10' AWAY FROM ANY OUTSIDE AIR INTAKE.

(K) PROVIDE AND INSTALL 1-FOOT OF GAS LINE DRIP LEG PRIOR TO CONNECTION OF FUEL BURNING EQUIPMENT.

KEY NOTES: ○

1. FIXTURE SHALL BE PROVIDED WITH THERMOSTATIC MIXING VALVE LOCATED UNDER PLUMBING FIXTURE EQUAL TO A LEONARD MODEL 170 WITH COLD WATER BY-PASS AND MOUNTING BRACKET. REFER TO DETAIL.
2. TRAP PRIMER WITH 1/2" LINE LOCATED ABOVE CEILING. REFER TO DETAIL.
3. WATER LINE FOR POOL. PLUMBING CONTRACTOR SHALL COORDINATE FINAL LOCATION OF WATER LINE WITH POOL CONTRACTOR PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT.
4. PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER LINE SIZE AND POINT OF CONNECTION WITH CIVIL PLANS PRIOR TO BID TO AVOID CONFLICTS. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.
5. DROP LINE INTO POOL FILL FUNNEL. REFER TO POOL CONSULTANT DRAWINGS. FURNISH SOLENOID VALVE(S) PER CONSULTANT RECOMMENDATIONS.
6. FIRE SPRINKLER RISER WITH BACKFLOW PREVENTER TO BE LOCATED INSIDE RISER ROOM. ROUTE FIRE DEPARTMENT CONNECTION LINE FROM RISER ROOM TO PROPOSED FREE-STANDING STORZ CONNECTION. REFER TO CIVIL PLANS.
7. PROPOSED FIRE SPRINKLER SUPPLY LINE. FIRE DEPARTMENT CONNECTION AND PIPE SHALL BE SIZED BY A LICENSED FIRE SPRINKLER DESIGNER. DESIGNER SHALL COORDINATE WITH ALL OTHER TRADES FOR WATER SUPPLY LINE REQUIREMENTS AND FIRE DEPARTMENT CONNECTION TO MEET CITY INSTALLATION REQUIREMENTS.
8. RISE CW LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
9. RISE HWR LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
10. RISE HW LINE UP ALONG WALL CAVITIES TO HIGHER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
11. RISE GAS DISTRIBUTION PIPING UP ABOVE ROOF SHALL BE ROUTED THRU GAS PIPE SCUPPER. REFER TO PLUMBING ROOF PLAN FOR CONTINUATION.
12. TANKLESS WATER HEATER SYSTEM SHALL BE INSTALLED AS PER MANUFACTURER RECOMMENDATIONS.
13. EACH GAS REGULATOR SHALL BE FURNISHED WITH A SHUT-OFF VALVE UP-STREAM OF REGULATOR.
14. CONNECT TO PROPOSED METERED GAS SERVICE PROVIDED BY GAS COMPANY. COORDINATE ROUTING AND POINT OF CONNECTION WITH GAS COMPANY PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICT. LINE SHALL SIZED FOR A GAS LOAD OF 9394 CFH.
15. RISE GAS DISTRIBUTION PIPING UP TO ROOF. REFER TO PLUMBING ROOF PLAN FOR CONTINUATION.

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

P1.02
PLUMBING HW/CW FLOOR PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH EXISTING CONDITIONS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, STATE CODES AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

(C) PLUMBING CONTRACTOR SHALL TERMINATE ALL WATER ROUGH-IN WITH SHUT-OFF VALVES BEFORE CONNECTING TO EQUIPMENT AND RELATED FIXTURES.

(D) PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

(E) INSULATE "P" TRAPS AND SUPPLIES AT HANDICAP LAVATORIES WITH INSULATION KIT.

(F) PROVIDE VACUUM BREAKER TO ALL FIXTURES WITH HOSE CONNECTION AND APPLIANCES WITH DIRECT CONNECTIONS TO DOMESTIC WATER.

(G) REFER TO ARCHITECTS DRAWINGS FOR MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES

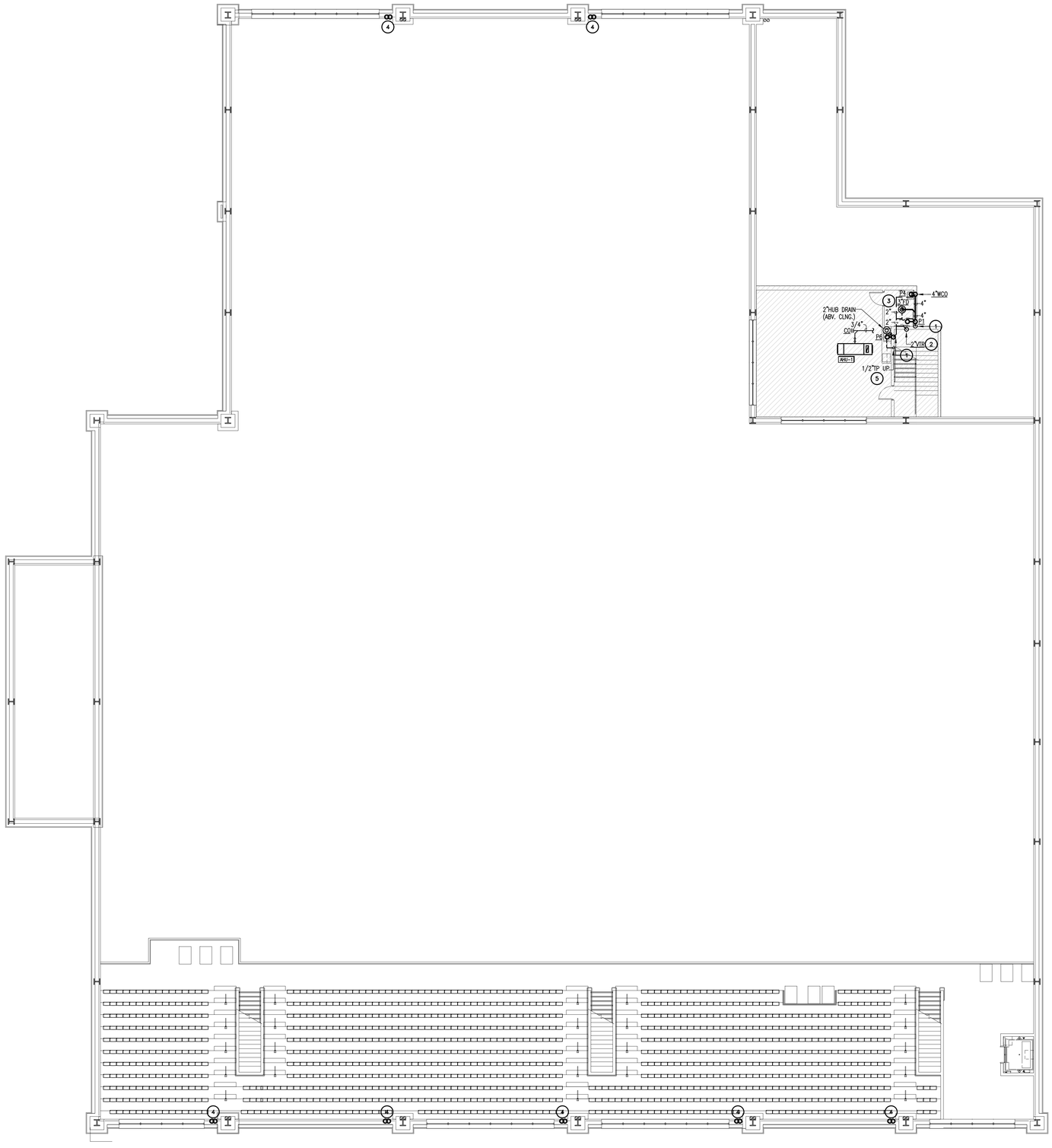
(H) PROVIDE CEILING ACCESS PANEL FOR WATER ISOLATION VALVES, IN OTHERWISE INACCESSIBLE AREAS. PROVIDE LOCKABLE HINGED ACCESS PANELS IN PUBLIC AREAS. PAINT PANELS TO MATCH SURROUNDING SURFACE.

(I) SAW CUT EXISTING SLAB AS REQUIRED TO ACCOMODATE NEW PLUMBING FIXTURE ROUGH-IN.

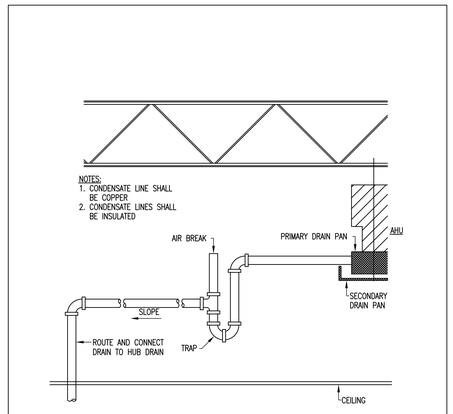
(J) ALL VENTS THROUGH ROOF SHALL BE FLASHED A MINIMUM OF 12" ABOVE ROOF. ALL VENTS SHALL BE MINIMUM OF 10' AWAY FROM ANY OUTSIDE AIR INTAKE.

KEY NOTES: ○

1. DROP SEWER LINE DOWN ALONG WALL CAVITIES TO LOWER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
2. RISE/DROP VENT LINE UP/DOWN ALONG WALL CAVITIES TO HIGHER/LOWER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
3. PROVIDE TRAP PRIMER CONNECTION FROM NEAREST FLUSH VALVE TRAP PRIMER, REFER TO DETAIL.
4. RISE/DROP STORM SEWER UP/DOWN TO HIGHER/LOWER LEVEL.
5. REFER TO HW/CW FLOOR PLAN FOR CONTINUATION OF PRIMER LINE AND TRAP PRIMER LOCATION ABOVE CEILING.



A PLUMBING SEWER FLOOR PLAN (ALT #1)
SCALE: 3/32" = 1'-0"



B SUSPENDED AIR HANDLER CONDENSATE DRAIN DETAIL
SCALE: NTS

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PEÑA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

P1.03

PLUMBING SEWER MEZZANINE PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH EXISTING CONDITIONS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

A PLUMBING HW/CW FLOOR PLAN
SCALE: 3/32" = 1'-0" (ALT #1)

KEY NOTES: ○

1. DROP CW LINE DOWN ALONG WALL CAVITIES TO LOWER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
2. DROP HW LINE DOWN ALONG WALL CAVITIES TO LOWER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
3. DROP HWR LINE DOWN ALONG WALL CAVITIES TO LOWER LEVEL SHALL BE PART OF ALTERNATE #1. REFER TO ARCHITECTURAL DRAWINGS.
4. FIXTURE SHALL BE PROVIDED WITH THERMOSTATIC MIXING VALVE LOCATED UNDER PLUMBING FIXTURE EQUAL TO A LEONARD MODEL 170 WITH COLD WATER BY-PASS AND MOUNTING BRACKET. REFER TO DETAIL.
5. RISE GAS DISTRIBUTION PIPING UP TO ROOF. REFER TO PLUMBING ROOF PLAN FOR CONTINUATION.
6. TRAP PRIMER WITH 1/2" LINE LOCATED ABOVE CEILING. REFER TO DETAIL.

GENERAL NOTES: ( )

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, STATE CODES AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

(C) PLUMBING CONTRACTOR SHALL TERMINATE ALL WATER ROUGH-IN WITH SHUT-OFF VALVES BEFORE CONNECTING TO EQUIPMENT AND RELATED FIXTURES.

(D) PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

(E) INSULATE "P" TRAPS AND SUPPLIES AT HANDICAP LAVATORIES WITH INSULATION KIT.

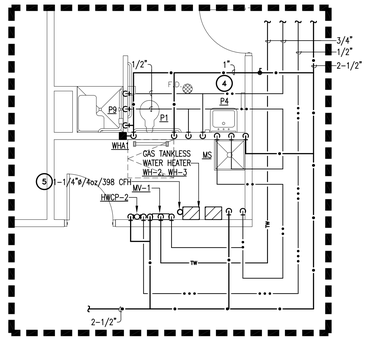
(F) PROVIDE VACUUM BREAKER TO ALL FIXTURES WITH HOSE CONNECTION AND APPLIANCES WITH DIRECT CONNECTIONS TO DOMESTIC WATER.

(G) REFER TO ARCHITECTS DRAWINGS FOR MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES

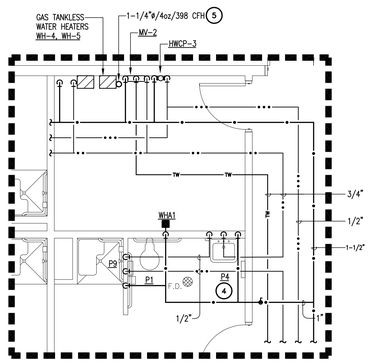
(H) PROVIDE CEILING ACCESS PANEL FOR WATER ISOLATION VALVES, IN OTHERWISE INACCESSIBLE AREAS. PROVIDE LOCKABLE HINGED ACCESS PANELS IN PUBLIC AREAS. PAINT PANELS TO MATCH SURROUNDING SURFACE.

(I) SAW CUT EXISTING SLAB AS REQUIRED TO ACCOMODATE NEW PLUMBING FIXTURE ROUGH-IN.

(J) ALL VENTS THROUGH ROOF SHALL BE FLASHED A MINIMUM OF 12" ABOVE ROOF. ALL VENTS SHALL BE MINIMUM OF 10' AWAY FROM ANY OUTSIDE AIR INTAKE.



B PLUMBING HW/CW FLOOR PLAN
SCALE: 1/4" = 1'-0"



C PLUMBING HW/CW FLOOR PLAN
SCALE: 1/4" = 1'-0"

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

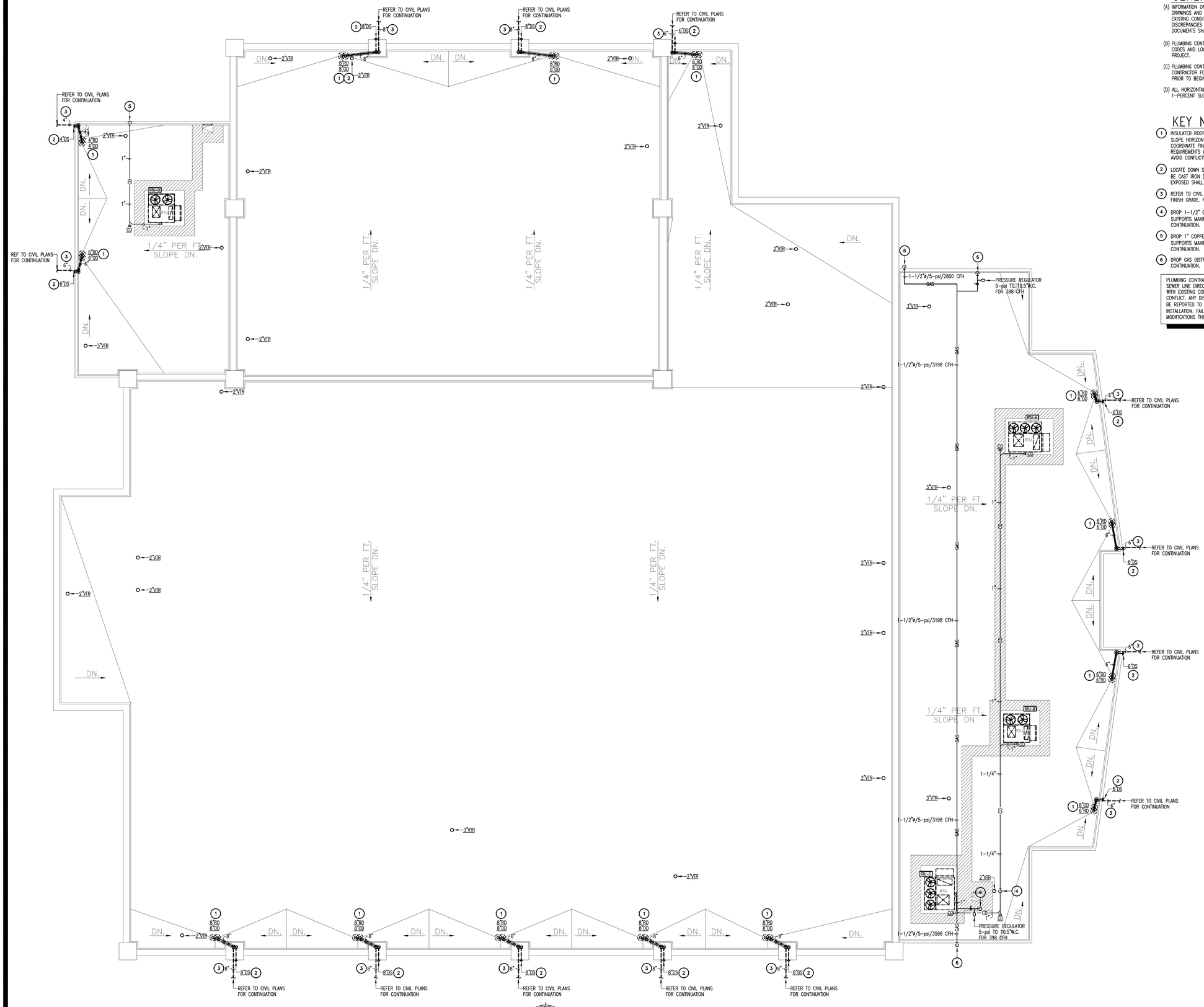
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

P1.04

PLUMBING HW/CW
MEZZANINE PLAN

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



A PLUMBING ROOF PLAN

SCALE: 3/32" = 1'-0"

GENERAL NOTES:

(A) INFORMATION ON THIS PLAN HAS BEEN OBTAINED FROM EXISTING DRAWINGS AND SITE SURVEY. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING WORK. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONSTRUCTION DOCUMENTS SHALL BE REPORTED TO THE ENGINEER.

(B) PLUMBING CONTRACTOR SHALL ADHERE TO ALL CITY CODES, STATE CODES AND LOCAL CODES THAT HAVE AUTHORITY OVER THIS PROJECT.

(C) PLUMBING CONTRACTOR TO COORDINATE WITH MECHANICAL CONTRACTOR FOR ANY INSTALLATION OF PIPING AND DUCTWORK PRIOR TO BEGINNING OF CONSTRUCTION

(D) ALL HORIZONTAL ROOF DRAIN LEADERS SHALL BE ROUTED AT 1-PERCENT SLOPE UNLESS OTHERWISE SPECIFIED.

KEY NOTES:

1. INSULATED ROOF DRAIN AND OVERFLOW ROOF DRAIN LEADERS IN FURR OUT. SLOPE HORIZONTAL LEADERS 1/8" PER FOOT. PLUMBING CONTRACTOR SHALL COORDINATE FINAL LOCATION OF ROOF DRAIN LEADER AND FURR OUT REQUIREMENTS WITH ARCHITECT PRIOR TO COMMENCEMENT OF WORK TO AVOID CONFLICTS. REFER TO ROOF PLAN FOR ROOF DRAIN LEADER SIZES.
2. LOCATE DOWN SPOUT 18" ABOVE FINISH GROUND LEVEL. LEADERS SHALLL BE CAST IRON (REFER TO SPECIFICATION). DRAIN LEADERS WHICH ARE EXPOSED SHALL BE PAINTED AS PER ARCHITECTURAL RECOMMENDATIONS.
3. REFER TO CIVIL PLANS FOR CONTINUATION OF ROOF DRAIN LEADER BELOW FINISH GRADE. REFER TO PLUMBING DETAIL FOR CLEAN OUT REQUIREMENT.
4. DROP 1-1/2" COPPER CONDENSATE DRAIN LINE AND PROVIDE PIPE HANGER SUPPORTS MAXIMUM 5'-0" O.C. SPACING. REFER TO PLUMBING PLAN FOR CONTINUATION.
5. DROP 1" COPPER CONDENSATE DRAIN LINE AND PROVIDE PIPE HANGER SUPPORTS MAXIMUM 5'-0" O.C. SPACING. REFER TO PLUMBING PLAN FOR CONTINUATION.
6. DROP GAS DISTRIBUTION PIPING DOWN. REFER TO PLUMBING PLANS FOR CONTINUATION.

PLUMBING CONTRACTOR SHALL COORDINATE DOMESTIC WATER AND SANITARY SEWER LINE DIRECTION OF FLOW, SIZE, INVERT, AND POINT OF CONNECTION WITH EXISTING CONDITIONS PRIOR TO INSTALLATION OF ROUGH-IN TO AVOID CONFLICT. ANY DISCREPANCIES FOUND BY THE PLUMBING CONTRACTOR SHALL BE REPORTED TO THE ENGINEER/ARCHITECT IMMEDIATELY AND PRIOR TO ANY INSTALLATION. FAILURE TO COMPLY SHALL MAKE ALL CORRECTIONS AND/OR MODIFICATIONS THE FULL RESPONSIBILITY OF THE CONTRACTOR.

THE WARREN GROUP
ARCHITECTS, INC.

1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

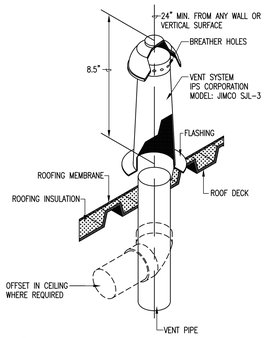
W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

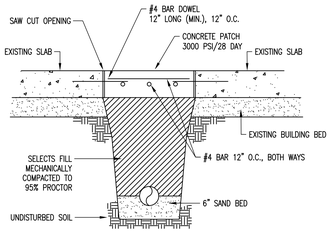
P1.05

PLUMBING
ROOF PLAN

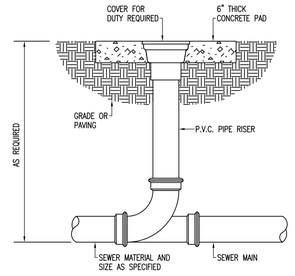
MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748



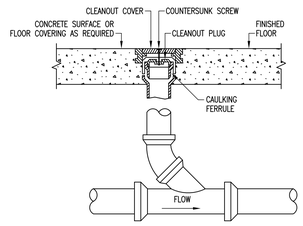
A VENT THROUGH ROOF DETAIL
SCALE: N.T.S.



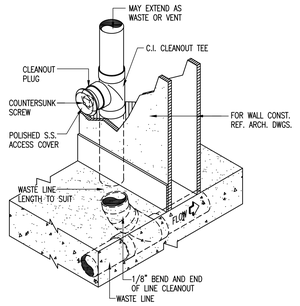
B SAW CUT DETAIL
SCALE: NTS



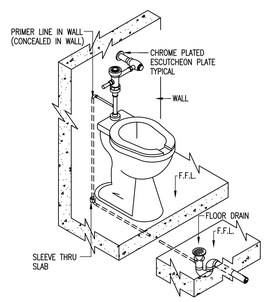
C EXTERIOR CLEANOUT DETAIL
SCALE: N.T.S.



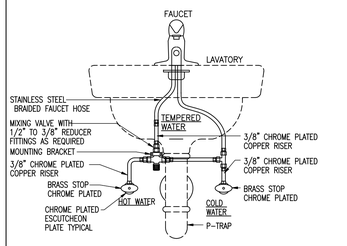
D FLOOR CLEANOUT DETAIL
SCALE: N.T.S.



E WALL CLEANOUT DETAIL
SCALE: N.T.S.

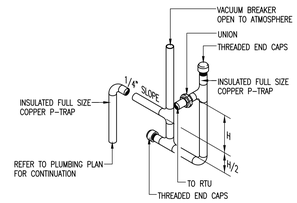


F FLUSH VALVE TRAP PRIMER DETAIL
SCALE: N.T.S.



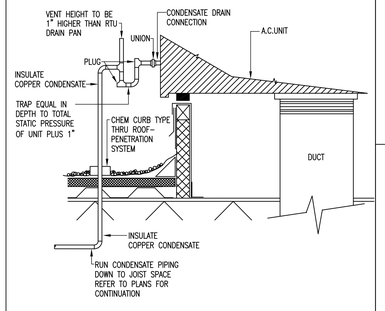
NOTE:
1. MIXING VALVE AND WATER LINES SHALL BE INSTALLED BETWEEN WALL AND P-TRAP TAILPIECE
2. PROVIDE AND INSTALL COVER KIT FOR P-TRAP AND STOPS.
3. FIELD INSULATE MIXING VALVE AND PIPING FROM MIXING VALVE TO FAUCET CONNECTION. JACKET INSULATION TO MATCH TRAP COVER KIT.
4. PROVIDE AND INSTALL REQUIRED 1/2" TO 3/8" REDUCERS AND CONNECTION FITTINGS.

G MIXING VALVE UNDER LAV DETAIL
SCALE: N.T.S.

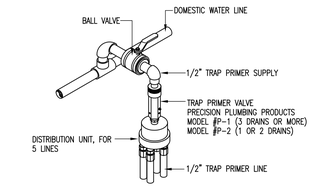


NOTE:
(1) H= FAN INLET PRESSURE (IN. W.C.) + 1-IN.
(2) CONDENSATE LINE SHALL BE INSULATED AND FURNISHED WITH ALUMINUM JACKET, (REFER TO SPECS.).

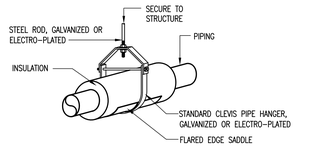
H RTU CONDENSATE P-TRAP DETAIL
SCALE: N.T.S.



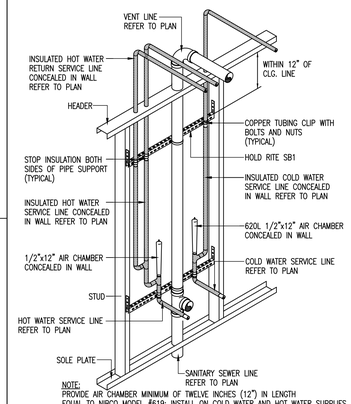
I ROOF TOP UNIT CONDENSATE CONNECTION DETAIL
SCALE: N.T.S.



J TRAP SEAL PRIMER DETAIL
SCALE: N.T.S.

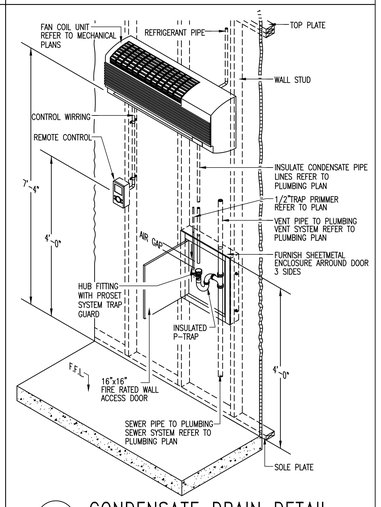


K PIPE HANGER SADDLE DETAIL
SCALE: NTS



NOTE:
PROVIDE AIR CHAMBER MINIMUM OF TWELVE INCHES (12") IN LENGTH EQUAL TO NIBCO MODEL #619; INSTALL ON COLD WATER AND HOT WATER SUPPLIES TO PLUMBING FIXTURES.

L PLUMBING FIXTURE INSTALLATION DETAIL
SCALE: N.T.S.



M CONDENSATE DRAIN DETAIL
SCALE: N.T.S.

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE TYPE	CONNECTION SIZE SEWER	VENT	CW	HW	DESCRIPTION
P1	WATER CLOSET (HANDICAP)	4"	2"	1"	–	VITREOUS CHINA, ELONGATED RIM, FLOOR MOUNTED WATER CLOSET WITH 1-1/2" TOP SPUD. ZURN "ECOVANTAGE" MODEL "Z5665-BWL". 16-3/4" RIM HEIGHT, 1.6 GPF, 10" ROUGH-IN, SIPHON JET ACTION WITH SLOAN "ROYAL" FLUSH MODEL "111-1P" WITH TRAP PRIMER CONNNECTION WHERE SHOWN ON PLANS, BENEKE MODEL "533" OPEN FRONT SEAT LESS COVER.
P2	WATER CLOSET	4"	2"	1"	–	VITREOUS CHINA, ELONGATED RIM, FLOOR MOUNTED WATER CLOSET WITH 1-1/2" TOP SPUD. ZURN "ECOVANTAGE" MODEL "Z5655-BWL". 15" RIM HEIGHT, 1.6 GPF, 10" ROUGH-IN, SIPHON JET ACTION WITH SLOAN "ROYAL" FLUSH MODEL "111-1P" WITH TRAP PRIMER CONNNECTION WHERE SHOWN ON PLANS, BENEKE MODEL "533" OPEN FRONT SEAT LESS COVER.
P3	URINAL (HANDICAP)	2"	2"	3/4"	–	VITREOUS CHINA, WALL HUNG, SIPHON JET ACTION WITH 3/4" TOP SPUD AND WALL HANGERS. MINIMUM 14" RIM TO WALL DISTANCE. EQUAL TO ZURN MODEL "Z5730" WITH SLOAN ROYAL "186-1" FLUSH VALVE AND APPROVED CARRIER SYSTEM.
P4	LAVATORY WALL HUNG (HANDICAP)	2"	2"	1/2"	1/2"	VITREOUS CHINA, WALL HUNG LAVATORY WITH HOLES ON 4" CENTERS EQUAL TO ZURN MODEL "Z5340". COMPLETE WITH LAVATORY FAUCET MOEN MODEL "8413F15". CHROME FINISH, SINGLE LEVER HANDLE, 1.5 GPM FLOW, ADA APPROVED, WITH CARRIER AND PROTECTIVE COVER ON P-TRAP.
P5	LAVATORY COUNTERTOP (HANDICAP)	2"	2"	1/2"	1/2"	VITREOUS CHINA, SELF RIMMING, OVAL (20"X17") LAVATORY WITH FAUCET HOLES ON 4" CENTERS EQUAL TO ZURN MODEL "Z5114". COMPLETE WITH LAVATORY FAUCET MOEN MODEL "8413F15". CHROME FINISH, SINGLE LEVER HANDLE, 1.5 GPM FLOW, ADA APPROVED AND PROTECTIVE COVER ON P-TRAP.
P6	STAINLESS STEEL COUNTERTOP SINK (HANDICAP)	2"	2"	1/2"	1/2"	SINGLE COMPARTMENT STAINLESS STEEL SINK EQUAL TO ELKAY MODEL "LRAD-2521-60-3". SELF RIMMING, 25"X21"X6", 3 HOLES ON 4" CENTERS, 18 GAUGE, UNDERCOATED. COMPLETE WITH MOEN MODEL "8289" SWING GOOSENECK SPOUT, CHROMED METAL WRIST BLADE HANDLES, DECK MOUNT FAUCET AND "LK-35" STRAINER WITH BASKET.
P7	SHOWER (HANDICAP)	–	–	–	1/2" TEMPERED WATER	PRESSURE BALANCING VALVE WITH CHECK STOPS ON INLETS, STAINLESS STEEL BALANCING PISTON EQUAL TO BRADLEY MODEL " S59-1000". SHOWER STALL SHALL BE EQUAL TO BRADLEY MODEL "HN300" COMPLETE WITH HAND HELD SHOWER, 60" METAL CLAD HOSE, BARRIER FREE SEAT AND ADA COMPLIANT GRAB BAR. SHOWER HEAD SHALL BE ADJUSTABLE PATTERN WITH CHROME PLATED BRASS ARM EQUAL TO BRADLEY MODEL "1C-S".
P8	SHOWER	–	–	–	1/2" TEMPERED WATER	BUILT IN SHOWER WITH PRESSURE BALANCING VALVE, STANDARD INSTITUTIONAL SHOWER HEAD AND WALL MOUNTED SOAP DISH, EQUAL TO BRADLEY "1C-EF-S1-ST-50".
P9	SHOWER (HANDICAP)	–	–	1/2"	1/2"	PRESSURE BALANCING SHOWER WITH INTEGRAL CHECK STOPS, AND ADJUSTABLE TEMPERATURE LIMIT STOPS EQUAL TO MOEN "POSI-TEMP" MODEL "8342". COMPLETE WITH HAND HELD SHOWER, 69" SHOWER HOSE, 30" SLIDE BAR, 1/2" CC CONNECTIONS, ADA COMPLIANT. POLISHED CHROME FINISH.
P10	BI-LEVEL ELECTRIC WATER COOLER (HANDICAP)	2"	2"	1/2"	–	BI-LEVEL, SELF-CONTAINED, WALL HUNG REFRIGERATED WATER COOLER EQUAL TO ELKAY "EZSTL-8". SELF CLOSING CONTROLS ON FRONT AND SIDE, STAINLESS STEEL BASIN. FLEX-GUARD BUBBLER CAPABLE OF DELIVERING 8.0 GPH OF 50°F WATER WITH 80°F INLET WATER AND 90°F ROOM TEMPERATURE. FURNISH WITH CARRIER AND APRON.
MS	MOP SINK FLOOR MOUNTED	2"	2"	3/4"	3/4"	TERRAZO, SQUARE MOP SINK EQUAL TO FIAT "TSBC-3010" 24"X24"X12" WITH 6" DROP FRONT, STAINLESS STEEL RIM GUARD AND "MSG-242A" WALL GUARD. COMPLETE WITH MOEN MODEL "8124 CHROME" SERVICE SINK FAUCET WITH 8" CENTERS, PAIL HOOK, AND VACUUM BREAKER SPOUT. COMPLETE WITH "832-AA" HOSE AND BRACKET, "889-CC" STAINLESS STEEL MOP BRACKET AND GRID STRAINER.
WH-1	WATER HEATER	–	–	–	–	TANKLESS WATER HEATER RATED AT 199,000 BTUH EQUAL TO A NAVIEN MODEL "NPE-240S". FURNISH WITH CONCENTRIC VENT KIT (FOR SIDE WALL MOUNTING), EXPANSION TANK. INSTALL SYSTEM PER MANUFACTURER RECOMMENDATIONS.
WH-2 WH-3	WATER HEATER	–	–	–	–	TANKLESS WATER HEATERS IN MANIFOLD CONFIGURATION WITH EACH RATED AT 199,000 BTUH EQUAL TO A NAVIEN MODEL "NPE-240S". FURNISH WITH CONCENTRIC VENT KIT (FOR SIDE WALL MOUNTING), EXPANSION TANK. INSTALL SYSTEM PER MANUFACTURER RECOMMENDATIONS.
WH-4 WH-5	WATER HEATER	–	–	–	–	TANKLESS WATER HEATERS IN MANIFOLD CONFIGURATION WITH EACH RATED AT 199,000 BTUH EQUAL TO A NAVIEN MODEL "NPE-240S". FURNISH WITH CONCENTRIC VENT KIT (FOR SIDE WALL MOUNTING), EXPANSION TANK. INSTALL SYSTEM PER MANUFACTURER RECOMMENDATIONS.
WH-6	WATER HEATER	–	–	–	–	TANKLESS WATER HEATER RATED AT 199,000 BTUH EQUAL TO A NAVIEN MODEL "NPE-240S". FURNISH WITH CONCENTRIC VENT KIT (FOR SIDE WALL MOUNTING), EXPANSION TANK. INSTALL SYSTEM PER MANUFACTURER RECOMMENDATIONS.
3"FD	GENERAL DUTY FLOOR DRAIN	3"	2"	–	–	ZURN MODEL "Z-415-B" LACQUERED CAST IRON FLOOR DRAIN. FURNISH COMPLETE WITH "TYPE B" NICKEL BRONZE STRAINER AND 1/2" TRAP PRIMER CONNECTION.
2"FD	SHOWER FLOOR DRAIN	2"	2"	–	–	ZURN MODEL "Z-415-B" LACQUERED CAST IRON FLOOR DRAIN. FURNISH COMPLETE WITH "TYPE B" NICKEL BRONZE STRAINER.
3"FS-1	FLOOR SINK	3"	2"	–	–	ZURN MODEL "Z-1910-P-2" PORCELAIN-ENAMELED CAST IRON FLOOR SINK. 8"X8"X6" WITH ANTI-SPLASH INTERIOR BOTTOM DOME STRAINER, PORCELAIN-ENAMELED CAST IRON 1/2" GRATE AND 1/2" TRAP PRIMER CONNECTION.
3"FS-2	FLOOR SINK	3"	2"	–	–	ZURN MODEL "Z-1900-P-2" PORCELAIN-ENAMELED CAST IRON FLOOR SINK. 12"X12"X6" WITH ANTI-SPLASH INTERIOR BOTTOM DOME STRAINER, PORCELAIN-ENAMELED CAST IRON 1/2" GRATE AND 1/2" TRAP PRIMER CONNECTION.
RICB	REFRIGERATOR ICE CONNECTION BOX	–	–	1/2"	–	GUY GRAY MODEL "BIM-875" ICE CONNECTION BOX.
WHB	WALL HYDRANT	–	–	3/4"	–	ZURN ELECTROL WALL HYDRANT MODEL "Z-1300" ENCASED, NON-FREEZE, ANTI-SIPHON, AUTOMATIC DRAINING HYDRANT FOR FLUSH WALL INSTALLATION COMPLETE WITH BACKFLOW PREVENTER, CLOSURE VALVE, NICKEL BRONZE BOX, HINGED COVER, KEY LOCK, AND "WATER" CAST ON COVER.
FCO-1	FLOOR CLEANOUT	4"	–	–	–	ZURN MODEL "ZN1400" LEVEL-TROL ADJUSTABLE FLOOR CLEANOUT WITH DURA-COATED CAST IRON BODY, GAS AND WATERTIGHT ABS TAPERED THREADED PLUG, AND ROUND SCORIATED POLISHED NICKEL BRONZE TOP ADJUSTABLE TO FINISHED FLOOR.
FCO-2	FLOOR CLEANOUT	4"	–	–	–	ZURN MODEL "EZC-PV4-R6-SS" ADJUSTABLE FLOOR CLEANOUT WITH PVC SOLVENT WELD BODY, GAS AND WATERTIGHT ABS TAPERED THREADED PLUG, AND ROUND SCORIATED STAINLESS STEEL TOP ADJUSTABLE TO FINISHED FLOOR.
YCO	YARD CLEANOUT	4"	–	–	–	ZURN MODEL "Z1400-HD" LEVEL-TROL ADJUSTABLE FLOOR CLEANOUT WITH DURA-COATED CAST IRON BODY, GAS AND WATERTIGHT ABS TAPERED THREADED PLUG, AND ROUND SCORIATED HEAVY-DUTY CAST IRON TOP ADJUSTABLE TO FINISHED FLOOR.
WCO	WALL CLEANOUT	4"	–	–	–	ZURN MODEL "Z1441" WALL CLEANOUT WITH DURA-COATED CAST IRON BODY, GAS AND WATERTIGHT ABS TAPERED THREADED PLUG, AND ROUND SMOOTH STAINLESS STEEL ACCESS COVER WITH SECURING SCREW.
HWCP-1	HOT WATER CIRCULATION PUMP	–	–	3/4"	3/4"	HOT WATER CIRCULATION PUMP SHALL BE EQUAL TO ARMSTRONG MODEL 20B050S-TA ASTRO SERIES, 1/25 HP, 115V/1PH/60Hz. PROVIDE WITH AUTOMATIC TIMER KIT.
WHA1	WATER HAMMER ARRESTOR	–	–	–	–	WATER HAMMER ARRESTOR FOR SINGLE RESTROOM SHALL BE EQUAL TO WADE PISTON-TYPE SHOKSTOPS MODEL # -P, COPPER FINNISH.
WHA2	WATER HAMMER ARRESTOR	–	–	–	–	WATER HAMMER ARRESTOR FOR GANG RESTROOMS SHALL BE EQUAL TO ZURN SHOKTROL MODEL # Z1700 SERIES, STAINLESS STEEL.
RD	PRIMARY ROOF DRAIN	–	–	–	–	ZURN MODEL "ZC-100-AC-W2-GD" LACQUERED CAST IRON ROOF DRAIN WITH COMBINATION MEMRANE FLASHING CLAMP/GRAVEL GUARD AND LOW SILHOUETTE CAST IRON DOME. COMPLETE WITH ANGULAR UNDER DECK CLAMP.
OD	OVERFLOW ROOF DRAIN	–	–	–	–	ZURN MODEL "ZC-100-AC-W2-GD" LACQUERED CAST IRON ROOF DRAIN WITH LOW SILHOUETTE CAST IRON DOME, MEMBRANE FLASHING CLAMP AND GRAVEL GUARD, AND INTERNAL 2" WATER DAM COMPLETE WITH ANGULAR UNDER DECK CLAMP.
DS	DOWN SPOUT NOZZLE	–	–	–	–	ZURN MODEL "ZANB-199" NICKEL BRONZE DOWN SPOUT NOZZLE WITH THREADED INLET AND WALL FLANGE.
SP-1	SUMP PUMP	–	–	–	–	STAINLESS STEEL SUMP PUMP SHALL BE EQUAL TO BELL & GOSSET MODEL "2WS0712", ½ HP, 230V/1PH/60HZ. PROVIDE SWITCH FOR MANUAL OPERATION.
ELSP-1	ELEVATOR SUMP PUMP PACKAGE SYSTEM	–	–	–	–	SUMP PUMP PACKAGE SYSTEM SHALL BE EQUAL TO PARK EQUIPMENT SYSTEM ELEVADER MODEL "ES100-HP-P50". CAPABLE OF AUTOMATICALLY REMOVING 50GPM PER ELEVATOR CAR. SYSTEM SHALL INCLUDE ELVATORSUMP PUMP, SAMPLE WELL, OIL-WATER INTERCEPTOR TANK, PUMP CONTROL PANLE WITH HIGH LEVEL ALARM.
TRENCH DRAIN	TRENCH DRAIN	4"	–	–	–	ZURN MODEL "Z884-HPP" CHANNELS SHALL BE 40 INCHES LONG, 4-¾" WIDE, MODULAR SECTIONS SHALL BE MADE OF POLYPROPYLENE, HAVE INTERLOCKING ENDS, AND RADIUSED BOTTOM. COMPLETE WITH ADA COMPLIANT HEEL PROOF POLYETHYLENE GRATE WITH MECHANICAL LOCKDOWN DEVICES. TRENCH DRAIN SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
HB	HOSE BIBB	–	–	3/4"	–	BACKFLOW PROTECTED WALL FAUCET EQUAL TO A WOODFORD MODEL "26-P" WITH POLISHED CHROME FINISH, 3/4" INLET, AND LOOSE TEE KEY.
MV-1 MV-2	THERMOSTATIC MIXING VALVE	–	–	3/4"	3/4"	DURA-TROL, ECO-MIX THERMOSTATIC WATER MIXING VALVE EQUAL TO LEONARD MODEL "TM-26".

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956.994.1900
twgarch.com

REVISION | DATE | APPROVED BY | DESCRIPTION

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED PROFESSIONAL ENGINEER
06.07.2019

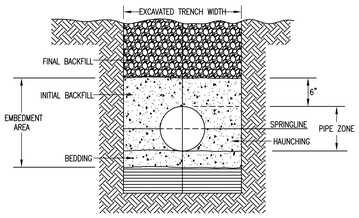
PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT 971805
DATE 06/07/2019
REVISED

P2.00
PLUMBING SCHEDULES



A UNDERGROUND INSTALLATION DETAIL OF PLASTIC PIPING SYSTEMS

SCALE: N.T.S.

UNDERGROUND INSTALLATION OF PLASTIC PIPE

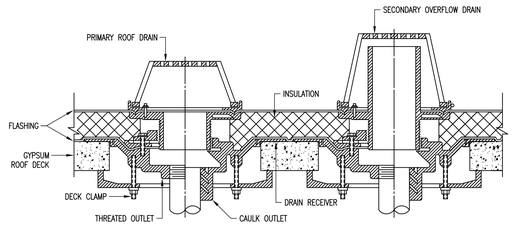
PLASTIC PIPE SHOULD ALWAYS BE BURIED IN STRICT ACCORDANCE WITH THE ASTM STANDARD RELEVANT TO THE TYPE OF PLASTIC PIPING SYSTEM BEING INSTALLED. THOSE STANDARDS ARE:

ASTM D2321 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY-FLOW APPLICATIONS.

ASTM D2774 STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PRESSURE PIPING

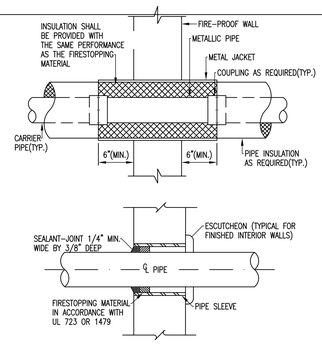
RECOMMENDATIONS FOR UNDERGROUND INSTALLATION OF PLASTIC DRAINAGE PIPE:

1. THE MINIMUM WIDTH OF THE TRENCH SHOULD BE THE PIPE OD (OUTSIDE DIAMETER) PLUS 16 INCHES OR THE PIPE OUTSIDE DIAMETER TIMES 1.25 PLUS 12 INCHES. THIS WILL ALLOW ADEQUATE ROOM FOR JOINING THE PIPE, SNAKING THE PIPE IN THE TRENCH TO ALLOW FOR EXPANSION AND CONTRACTION WHERE APPROPRIATE AND SPACE FOR BACKFILLING AND COMPACTION EQUIPMENT USED TO COMPACT THE BACKFILL.
2. PROVIDE A MINIMUM OF 4 INCHES OF FIRM, STABE AND UNIFORM BEDDING MATERIAL IN THE TRENCH BOTTOM. IF ROCK OR UNYIELDING MATERIAL IS ENCOUNTERED, A MINIMUM OF 6 INCHES OF BEDDING SHALL BE USED. BLOCKING SHOULD NOT BE USED TO CHANGE PIPE GRADE OR TO INTERMITTENTLY SUPPORT PIPE OVER LOW SECTIONS IN THE TRENCH.
3. THE PIPE SHOULD BE SURROUNDED WITH AN AGGREGATE MATERIAL WHICH CAN BE EASILY WORKED AROUND THE SIDES OF THE PIPE. BACKFILLING SHOULD BE PERFORMED IN LAYERS OF 6 INCHES WITH EACH LAYER BEING SUFFICIENTLY COMPACTED TO 85% TO 95% COMPACTION.
4. A MECHANICAL TAMPER IS RECOMMENDED FOR COMPACTING SAND AND GRAVEL. THESE MATERIALS CONTAIN FINE-GRAINS, SUCH AS SILT AND CLAY. IF A TAMPER IS NOT AVAILABLE, COMPACTING SHOULD BE DONE BY HAND.
5. THE TRENCH SHOULD BE COMPLETELY FILLED. THE BACKFILL SHOULD BE PLACED AND SPREAD IN UNIFORM LAYERS TO PREVENT ANY UNFILLED SPACES OR VOIDS. LARGE ROCKS, STONES, FROZEN CLODS, OR OTHER LARGE DEBRIS SHOULD BE REMOVED. STONE BACKFILL SHALL PASS THROUGH AN 1-1/2" SIEVE. ROCK SIZE SHOULD BE ABOUT ONE-TENTH OF THE PIPE OUTSIDE DIAMETER. HEAVY TAMPERS OR ROLLING EQUIPMENT SHOULD ONLY BE USED TO CONSOLIDATE THE FINAL BACKFILL.
6. TO PREVENT DAMAGE TO THE PIPE AND DISTURBANCE TO PIPE EMBEDMENT, A MINIMUM DEPTH OF BACKFILL ABOVE THE PIPE SHOULD BE MAINTAINED. PIPE SHOULD ALWAYS BE INSTALLED BELOW THE FROST LEVEL. TYPICALLY, IT IS NOT ADVISABLE TO ALLOW VEHICULAR TRAFFIC OR HEAVY CONSTRUCTION EQUIPMENT TO TRAVERSE THE PIPE TRENCH.



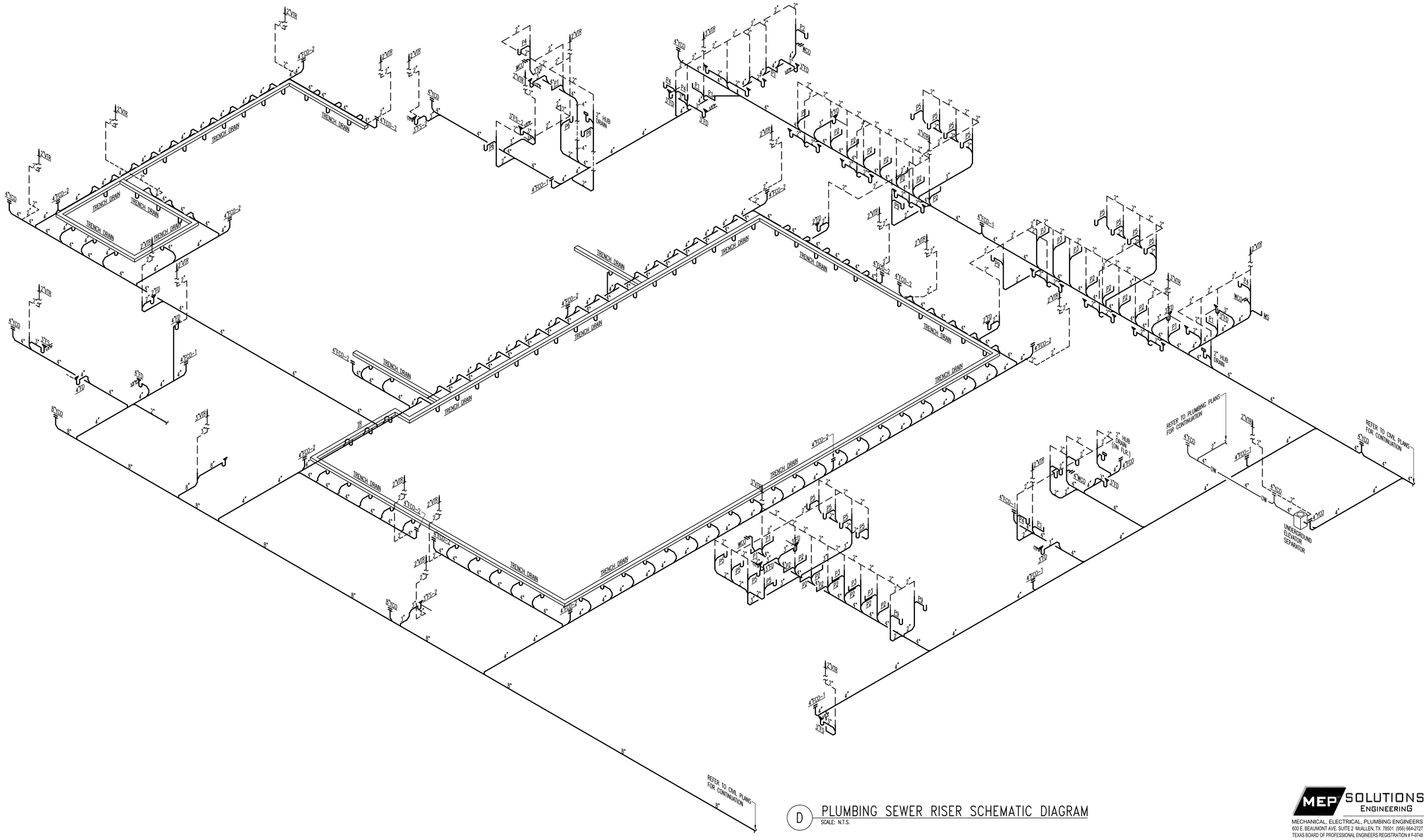
B ROOF AND OVERFLOW DRAIN DETAIL

SCALE: N.T.S.



C TYPICAL FIRE PROOF & WALL PENETRATION

SCALE: N.T.S.



D PLUMBING SEWER RISER SCHEMATIC DIAGRAM

SCALE: N.T.S.

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX. 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

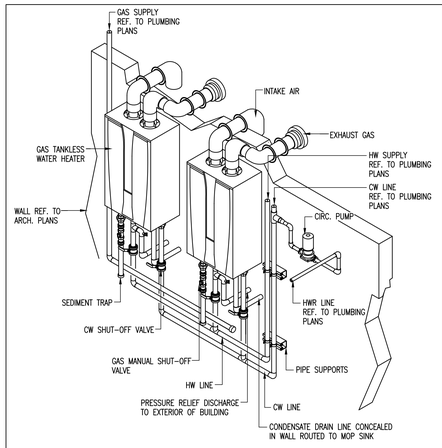
CITY OF PHARR AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

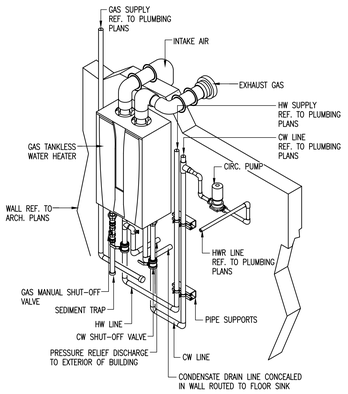
PROJECT	971805
DATE	06/07/2019
REVISED	

P2.01

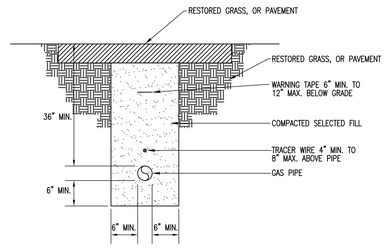
PLUMBING SEWER RISER DIAGRAM



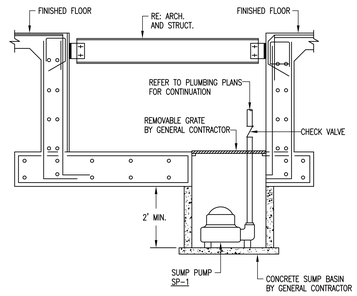
A WATER HEATER DETAIL
SCALE: N.T.S.



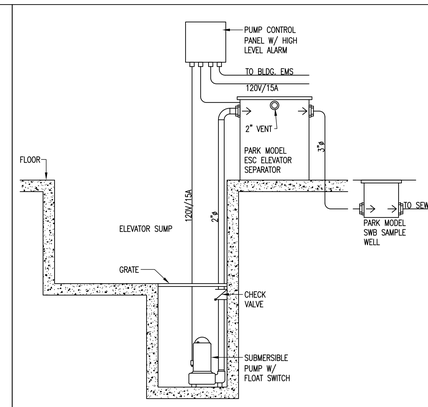
B WATER HEATER DETAIL
SCALE: N.T.S.



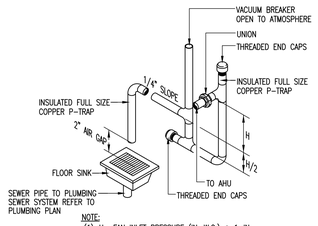
C UNDERGROUND
GAS PIPE TRENCH SECTION DETAIL
SCALE: N.T.S.



D PIT PUMP DETAIL
SCALE: N.T.S.



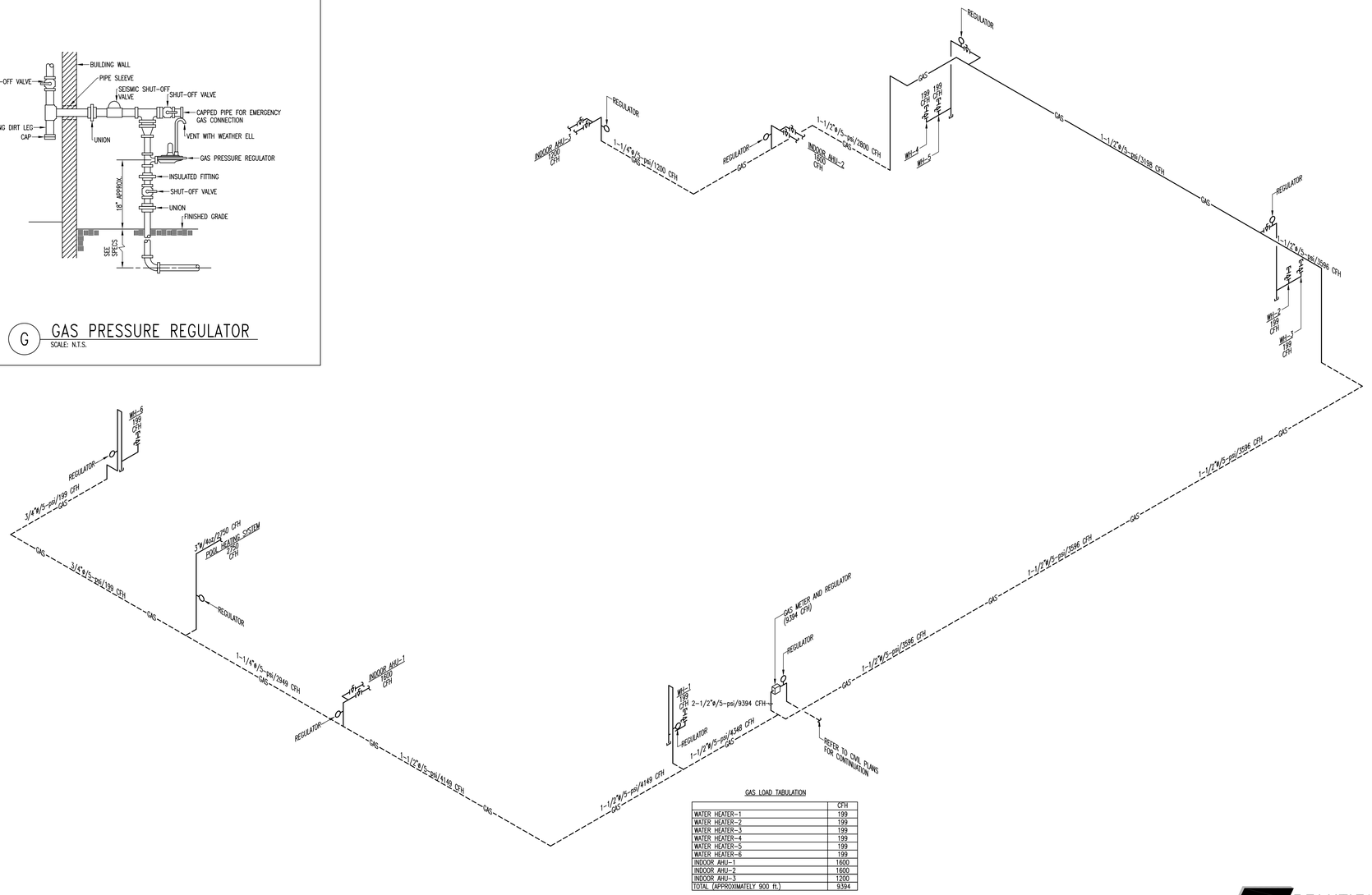
E ELEVATOR SUMP PUMP DIAGRAM
SCALE: N.T.S.



NOTE:
(1) H= FAN INLET PRESSURE (IN. W.C.) + 1-IN.
(2) CONDENSATE LINE SHALL BE INSULATED AND FURNISHEDD WITH PVC JACKET (LABELED CONDENSATE), (REFER TO SPECS.).

F AHU CONDENSATE P-TRAP DETAIL
SCALE: N.T.S.

G GAS PRESSURE REGULATOR
SCALE: N.T.S.



GAS LOAD TABULATION

	CFH
WATER HEATER-1	199
WATER HEATER-2	199
WATER HEATER-3	199
WATER HEATER-4	199
WATER HEATER-5	199
WATER HEATER-6	199
INDOOR AHU-1	1600
INDOOR AHU-2	1600
INDOOR AHU-3	1200
TOTAL (APPROXIMATELY 900 ft.)	9394

H PLUMBING SEWER RISER SCHEMATIC DIAGRAM
SCALE: N.T.S.

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

TWG
THE WARREN GROUP
ARCHITECTS, INC.
1801 SOUTH SECOND ST.
SUITE 330
McALLEN, TX 78503
956 . 994 . 1900
twgarch.com

REVISION	DATE	APPROVED BY	DESCRIPTION
1			

STATE OF TEXAS
LUIS JAVIER PENA
97260
LICENSED
PROFESSIONAL ENGINEER
06.07.2019

PROPOSED

CITY OF PHARR
AQUATIC FACILITY

W SIOUX RD AND EXPRESSWAY 281
PHARR, TEXAS 78577

PROJECT	971805
DATE	06/07/2019
REVISED	

P2.02

PLUMBING GAS
RISER DIAGRAM

COMcheck Software Version 4.1.1.0

Interior Lighting Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	CITY OF PHARR AQUATIC FACILITY
Project Type:	New Construction

Construction Site:
W. SIOUX RD AND EXPRESSWAY
281
PHARR, TX 78577

Owner/Agent:
LAURA WARREN A.I.A.
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH 2ND STREET
SUITE 330
McALLEN, TX 78503
956.994.1900

Designer/Contractor:
Abram L. Dominguez
MEP Solutions Engineering
600 E. Beaumont Ave.
Suite 2
McAllen, TX 78501
956.664.2727

Additional Efficiency Package(s)

Reduced interior lighting power. Requirements are implicitly enforced within interior lighting allowance calculations.

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B X C)
1-Gymnasium	75028	0.85	63474
2-Fixture shall have a high end trim at 700 watts. (Gymnasium)	37143	0.85	31423
		Total Allowed Watts =	94897

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
1-Gymnasium				
LED 1: TYPE A: 2'X4' EDGE LIT FLAT PANEL: Other:	1	62	47	2914
LED 2: TYPE B: 2'X4' EDGE LIT FLAT PANEL: Other:	1	36	27	972
LED 3: TYPE C: 6" RECESSED DOWNLIGHT: Other:	1	1	13	13
LED 4: TYPE D: 6" RECESSED DOWNLIGHT: Other:	1	106	19	2014
LED 5: TYPE F: 4' STRIPLIGHT: Other:	1	79	30	2370
LED 6: TYPE G2: 2' RECESSED PERIMETER LIGHTING: Other:	1	2	7	14
LED 7: TYPE G3: 3' RECESSED PERIMETER LIGHTING: Other:	1	9	10	90
LED 8: TYPE G4: 4' RECESSED PERIMETER LIGHTING: Other:	1	23	14	322
LED 9: TYPE H3: 3' ZIPTWO LED SYSTEM: Other:	1	7	21	147
LED 10: TYPE H4: 4' ZIPTWO LED SYSTEM: Other:	1	77	28	2156
LED11: TYPE M: THE MARINER: Other:	1	7	127	889
LED12: TYPE N: 4' STAIRWAY FIXTURE: Other:	1	5	30	150
LED13: TYPE P: 2'X4' EDGE LIT FLAT PANEL: Other:	1	8	47	376
LED14: TYPE Q: 2'X4' EDGE LIT FLAT PANEL: Other:	1	9	28	252
2-Fixture shall have a high end trim at 700 watts. (Gymnasium)				
LED 15: TYPE K: POLARIS LED FLOOD LIGHT: Other:	1	112	700	78400
			Total Proposed Watts =	91079

Interior Lighting PASSES: Design 4% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Abram L. Dominguez, P.E.	Abram L. Dominguez	06/07/2019
Name - Title	Signature	Date

COMcheck Software Version 4.1.1.0

Exterior Lighting Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	CITY OF PHARR AQUATIC FACILITY
Project Type:	New Construction
Exterior Lighting Zone	3 (Other)

Construction Site:
W. SIOUX RD AND EXPRESSWAY
281
PHARR, TX 78577

Owner/Agent:
LAURA WARREN A.I.A.
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH 2ND STREET
SUITE 330
McALLEN, TX 78503
956.994.1900

Designer/Contractor:
Abram L. Dominguez
MEP Solutions Engineering
600 E. Beaumont Ave.
Suite 2
McAllen, TX 78501
956.664.2727

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B X C)
Parking area	216967 ft2	0.1	Yes	21697
Illuminated area of facade wall or surface	3923880 ft2	0.15	No	588582
Illuminated area of facade wall or surface	6930 ft2	0.15	No	1040
			Total Tradable Watts (a) =	21697
			Total Allowed Watts =	611318
			Total Allowed Supplemental Watts (b) =	750

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.

(b) A supplemental allowance equal to 750 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Parking area (216967 ft2): Tradable Wattage				
LED 1: TYPE SA: SINGLE HEAD AREA LIGHT: Other:	1	10	114	1140
LED 2: TYPE SB: FOUR HEAD AREA LIGHT: Other:	1	6	456	2736
LED 3: TYPE SD: TESIS IN-GROUND LUMINAIRE: Other:	1	9	20	180
LED 4: TYPE SJ: THREE HEAD AREA LIGHT: Other:	1	2	324	648
LED 9: TYPE SK4: 4' RHYTHM LINEAR LED FLOOD: Other:	1	6	57	342
Illuminated area of facade wall or surface (3923880 ft2): Non-tradable Wattage				
LED 5: TYPE SC: ARCHITECTURAL WALL SCONCE: Other:	1	21	50	1050
LED 6: TYPE SF: M9700C IN-GRADE LUMINAIRE: Other:	1	17	35	595
Illuminated area of facade wall or surface (6930 ft2): Non-tradable Wattage				
LED 8: TYPE SL: 4' LINEAR LED FLOOD LIGHT: Other:	1	6	64	384
			Total Tradable Proposed Watts =	5046

Exterior Lighting PASSES: Design 78% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Abram L. Dominguez, P.E.	Abram L. Dominguez	06/07/2019
Name - Title	Signature	Date

COMcheck Software Version 4.1.1.0

Mechanical Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	CITY OF PHARR AQUATIC FACILITY
Location:	Pharr, Texas
Climate Zone:	2a
Project Type:	New Construction

Construction Site:
W. SIOUX RD AND EXPRESSWAY
281
PHARR, TX 78577

Owner/Agent:
LAURA WARREN A.I.A.
THE WARREN GROUP ARCHITECTS, INC.
1801 SOUTH 2ND STREET
SUITE 330
McALLEN, TX 78503
956.994.1900

Designer/Contractor:
Abram L. Dominguez
MEP Solutions Engineering
600 E. Beaumont Ave.
Suite 2
McAllen, TX 78501
956.664.2727

Additional Efficiency Package(s)

Reduced interior lighting power. Requirements are implicitly enforced within interior lighting allowance calculations.

Mechanical Systems List

Quantity	System Type & Description
1	HVAC System 1 (Single Zone): Cooling: 1 each - Single Package DX Unit, Capacity = 204 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 12.50 EER, Required Efficiency: 11.00 EER + 12.4 IEER Fan System: None
1	HVAC System 2 (Single Zone): Cooling: 1 each - Single Package DX Unit, Capacity = 184 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 11.40 EER, Required Efficiency: 11.00 EER + 12.4 IEER Fan System: None
1	HVAC System 3 (Single Zone): Cooling: 1 each - Single Package DX Unit, Capacity = 232 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 12.50 EER, Required Efficiency: 11.00 EER + 12.4 IEER Fan System: None
1	HVAC System 4 (Single Zone): Heating: 1 each - Central Furnace, Electric, Capacity = 102 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Single Package DX Unit, Capacity = 126 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 12.80 EER, Required Efficiency: 11.20 EER + 12.8 IEER Fan System: None
1	HVAC System 5 (Single Zone): Heating: 1 each - Central Furnace, Electric, Capacity = 36 kBtu/h No minimum efficiency requirement applies Cooling: 1 each - Single Package DX Unit, Capacity = 35 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 14.00 SEER, Required Efficiency: 14.00 SEER Fan System: None
2	HVAC System 6 (Single Zone): Split System Heat Pump Heating Mode: Capacity = 22 kBtu/h, Proposed Efficiency = 9.00 HSPF, Required Efficiency = 8.20 HSPF Cooling Mode: Capacity = 18 kBtu/h, Proposed Efficiency = 14.00 SEER, Required Efficiency: 14.00 SEER

Quantity	System Type & Description
	Fan System: None
6	Water Heater 1:
	Gas Instantaneous Water Heater, Capacity: 2 gallons, Input Rating: 75 kBtu/h w/ Circulation Pump
	Proposed Efficiency: 0.85 EF, Required Efficiency: 0.62 EF

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.1.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Luis Javier Pena, P.E.		06/07/2019
Name - Title	Signature	Date

COM*check* Software Version 4.1.1.0

Inspection Checklist

Energy Code: 2015 IECC

Requirements: 0.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR3][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR8][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.2.4.5, C403.2.4.6 [FO9][3]	Snow/ice melting system sensors for future connection to controls. Freeze protection systems have automatic controls installed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.5, C404.5.1, C404.5.2 [PL6][3]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1, C404.6.2 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.3 [PL7][3]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.7 [PL8][3]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .1 [ME65][3]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.2.12 .3 [ME117][2]	Fans have efficiency grade (FEG) >= 67. The total efficiency of the fan at the design point of operation <= 15% of maximum total efficiency of the fan.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.13 [ME71][2]	Unenclosed spaces that are heated use only radiant heat.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.3 [ME55][2]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.6. 1 [ME59][1]	Demand control ventilation provided for spaces >500 ft2 and >25 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.6. 2 [ME115][3]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.2.7(1) and C403.2.7(2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME116][3]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9 [ME60][2]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9 [ME10][2]	Ducts and plenums sealed based on static pressure and location.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9. 1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9. 1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9. 1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.2.9.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.9.1.3 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C408.2.2.1 [ME53][3]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.5, C403.5.1, C403.5.2 [ME123][3]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.5.1 and refrigeration compressor systems that comply with C403.5.2..	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.1 [EL15][1]	Lighting controls installed to uniformly reduce the lighting load by at least 50%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1 [EL18][1]	Occupancy sensors installed in required spaces.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1, C405.2.2.3 [EL23][2]	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.1 [EL22][2]	Automatic controls to shut off all building lighting installed in all buildings.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL16][2]	Daylight zones provided with individual controls that control the lights independent of general area lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3, C405.2.3.1, C405.2.3.2 [EL20][1]	Primary sidelighted areas are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3, C405.2.3.1, C405.2.3.3 [EL21][1]	Enclosed spaces with daylight area under skylights and rooftop monitors are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.4 [EL4][1]	Separate lighting control devices for specific uses installed per approved lighting plans.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.4 [EL8][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.5 [EL25][null]	Automatic lighting controls for exterior lighting installed. Controls will be daylight controlled, set based on business operation time-of-day, or reduce connected lighting > 30%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.3 [EL6][1]	Exit signs do not exceed 5 watts per face.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17][3]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.3, C408.2.5.3 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.2 [FI27][3]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1 [FI47][3]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1.1 [FI42][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1.2 [FI38][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C403.2.4.1.3 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI39][3]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2.1, C403.2.4.2.2 [FI40][3]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.3 [FI11][3]	Heat traps installed on supply and discharge piping of non-circulating systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.4 [FI25][2]	All piping insulated in accordance with section details and Table C403.2.10.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.6.1 [FI12][3]	Controls are installed that limit the operation of a recirculation pump installed to maintain temperature of a storage tank. System return pipe is a dedicated return pipe or a cold water supply pipe.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.4.1 [FI18][1]	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Interior Lighting fixture schedule for values.*
C405.5.1 [FI19][1]	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Exterior Lighting fixture schedule for values.*
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.1 [FI31][1]	HVAC equipment has been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.2 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.2.5.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.1 [FI16][3]	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.3 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.4 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI33][1]	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)