LOS FRESNOS CITY HALL
500 E OCEAN BLVD. LOS FRESNOS, TX 78566

PROJECT MANUAL

JUNE 11, 2018
BRW PROJECT NO. 217072.00

THE CITY OF LOS FRESNOS — **OWNER**
200 N BRAZIL
LOS FRESNOS, TX 78566
(956) 233-5768

BROWN REYNOLDS WATFORD ARCHITECTS, INC. — **ARCHITECT**
2700 EARL RUDDER FRWY SOUTH, SUITE 4000
COLLEGE STATION, TEXAS 77845
(979) 694-1791

GESSNER ENGINEERING, LLC — **CIVIL / STRUCTURAL ENGINEER**
2501 ASHFORD DRIVE, SUITE 102
COLLEGE STATION, TEXAS 77845
(979) 680-8840

JORDAN & SKALA ENGINEERS — **MECHANICAL / ELECTRICAL / PLUMBING ENGINEER**
10375 RICHMOND AVE., STE 300
HOUSTON, TEXAS 77042
(281) 617-3200

SECTION 00 00 07 - SEALS PAGE

ARCHITECT AND CONSULTANTS SEALS PAGE

ARCHITECT:
Brown Reynolds Watford Architects, Inc.
Ray Holliday, AIA, ASLA, LI
2700 Earl Rudder Frwy, Suite 4000
College Station, TX 77845
979 / 694-1791

CIVIL ENGINEER:
Gessner Engineering, LLC
Kyle R. Harvey, P.E.
2501 Ashford Dr
College Station, TX 77840
979 / 220-5304

STRUCTURAL ENGINEER:
Gessner Engineering, LLC
Nikolas A. Gomes, M.S., P.E.
11913 Starcrest Drive
San Antonio, TX 78247
210 / 305-4792

MEP ENGINEER:
Jordan & Skala Engineers
Mechanical: Christopher J. Claudet, P.E.
Plumbing: Christopher J. Claudet, P.E.
Electrical: Christopher J. Claudet, P.E.
Technology: Christopher J. Claudet, P.E.
10375 Richmond Ave., Ste 300
Houston, TX 77042
281 / 617-3200

SECTION 00 00 10 - TABLE OF CONTENTS

00 00 07 - Seals Page	01 - 01
00 00 10 - Table of Contents	01 - 05
00 00 15 - List of Drawings	01 - 02
00 10 00 - Bid Solicitation	01 - 01
00 20 00 - Instructions to Proposers	01 - 03
00 30 00 - Information Available to Proposers	01 - 01
00 30 00A - Geotechnical Investigation Report	01 - 33
00 42 00 - Proposal Form	01 - 05
00 43 93 - Proposal Submission Checklist	01 - 01
00 45 00 - Representations and Certifications	01 - 01
00 45 00A - Contractor's Qualification Statement	01 - 04
00 45 00B - Non-Collusion Affidavit	01 - 01
00 45 00C - Conflict of Interest Questionnaire	01 - 01
00 45 00D - Equal Employment Opportunity Affidavit	01 - 01
00 50 00 - General Form of Agreement	01 - 01
00 50 00A - AIA A101 Standard Form of Agreement	01 - 07
00 60 00 - Bonds and Insurance	01 - 01
00 60 00A - Bid Security, Performance Bond and Payment Bond	01 - 03
00 70 00 - General Conditions of the Contract	01 - 01
00 70 00A - AIA A201 General Conditions	01 - 38

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00 - Summary	01 - 05
01 21 00 - Allowances	01 - 02
01 23 00 - Alternates	01 - 03
01 25 00 - Substitution Procedures	01 - 03
01 25 00A - Attachment A (Substitution Request Form)	01 - 02
01 26 00 - Contract Modification Procedures	01 - 02
01 29 00 - Payment Procedures	01 - 04
01 31 00 - Project Management and Coordination	01 - 09
01 32 00 - Construction Progress Documentation	01 - 05
01 32 33 - Photographic Documentation	01 - 02
01 33 00 - Submittal Procedures	01 - 10
01 33 00A - Attachment A (Submittal Transmittal)	01 - 01
01 40 00 - Quality Requirements	01 - 09
01 42 00 - Reference Standards	01 - 12
01 50 00 - Temporary Facilities and Controls	01 - 12
01 60 00 - Product Requirements	01 - 05
01 73 00 - Execution	01 - 09
01 73 00A - Attachment A (RFI)	01 - 01
01 77 00 - Closeout Procedures	01 - 05
01 77 00A - Substantial Completion Checklist	01 - 05
01 77 00B - Punch List	01 - 01
01 78 23 - Operation and Maintenance Data	01 - 07
01 78 39 - Project Record Documents	01 - 03
01 79 00 - Demonstration and Training	01 - 03

DIVISION 03 - CONCRETE

03 10 00 - Concrete Formwork 01 - 03
03 20 00 - Concrete Reinforcement 01 - 05
03 30 00 - Cast-In-Place Concrete 01 - 15
03 45 00 - Architectural Precast Concrete 01 - 10

DIVISION 04 - MASONRY

04 72 00 - Cast Stone Masonry 01 - 04
04 73 00 - Manufactured Stone Masonry 01 - 05

DIVISION 05 - METALS

05 12 00 - Structural Steel Framing 01 - 08
05 50 00 - Metal Fabrications 01 - 06

DIVISION 06 - WOOD AND PLASTICS

06 10 00 - Rough Carpentry 01 - 08
06 11 00 - Wood Framing 01 - 07
06 16 00 - Sheathing 01 - 05
06 17 53 - Shop Fabricated Wood Trusses 01 - 04
06 40 23 - Interior Architectural Woodwork 01 - 10

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 11 13 - Bituminous Dampproofing 01 - 03
07 21 00 - Thermal Insulation 01 - 03
07 26 00 - Vapor Barrier Membrane 01 - 03
07 27 13 - Modified Bituminous Sheet Air Barrier 01 - 07
07 27 19 - Plastic Film Air Barrier 01 - 05
07 31 13 - Shingle Roofing & Flashing 01 - 05
07 40 00 - Metal Roof Panels 01 - 06
07 46 46 - Mineral-Fiber Cement Soffit Panels 01 - 03
07 54 00 - Thermoplastic Membrane Roofing (PVC) 01 - 11
07 62 00 - Sheet Metal Flashing and Trim 01 - 06
07 71 00 - Roof Specialties 01 - 07
07 72 00 - Roof Accessories 01 - 04
07 72 50 - Passive Exhaust Ventilators 01 - 03
07 84 13 - Penetration Firestopping 01 - 04
07 92 00 - Joint Sealants 01 - 04

DIVISION 08 - DOORS AND WINDOWS

08 11 00 - Metal Doors and Frames 01 - 03
08 14 16 - Flush Wood Doors 01 - 06
08 17 43 - FRP Aluminum Hybrid Doors 01 - 06
08 31 13 - Access Doors and Frames 01 - 03
08 33 00 - Rolling Counter Shutters 01 - 03
08 41 13 - Aluminum Entrances and Storefront 01 - 08
08 71 00 - Door Hardware 01 - 19
08 71 13 - Automatic Door Operator 01 - 07
08 80 00 - Glazing 01 - 11
08 88 13 - Fire Resistant Glazing 01 - 05

DIVISION 09 - FINISHES

09 21 00 - Gypsum Board Assemblies 01 - 09
09 22 26 - Metal Suspension Systems 01 - 03
09 24 10 - Stucco Plaster 01 - 05
09 30 13 - Ceramic Tiling 01 - 09
09 51 00 - Acoustical Ceilings 01 - 02
09 65 00 - Resilient Flooring 01 - 04
09 68 13 - Tile Carpeting 01 - 04
09 81 00 - Acoustical Insulation 01 - 02
09 91 00 - Painting 01 - 10

DIVISION 10 - SPECIALTIES

10 11 00 - Visual Display Surfaces 01 - 02
10 14 00 - Signage 01 - 07
10 21 13 - Plastic Toilet Compartments 01 - 03
10 22 26 - Operable Partitions 01 - 04
10 26 14 - Wall and Corner Protection 01 - 02
10 28 13 - Toilet Accessories 01 - 02
10 44 00 - Fire Protection Specialties 01 - 02

DIVISION 11 - EQUIPMENT

11 15 00 - After-Hours Deposit Box 01 - 01
11 33 00 - Retractable Stairs 01 - 03
11 52 13 - Projection Screens 01 - 02

DIVISION 12 - FURNISHINGS

12 21 00 - Window Blinds 01 - 03

DIVISION 14 - CONVEYING EQUIPMENT

14 92 00 - Pneumatic Tube System 01 - 05

DIVISION 21 - FIRE SUPPRESSION

21 00 00 - Fire Protection General 01 - 14

DIVISION 22 - PLUMBING

22 00 00 - Plumbing General 01 - 22
22 40 00 - Plumbing Fixtures 01 - 03

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

23 00 00 - HVAC General 01 - 13
23 05 93 - Testing, Adjusting and Balancing 01 - 04
23 07 00 - HVAC Insulation 01 - 03
23 23 00 - Refrigerant Piping 01 - 03
23 31 00 - Ductwork and Accessories 01 - 12
23 34 00 - Unitary Exhaust and Supply Fans and Ventilators 01 - 02
23 37 00 - Louvers, Grilles, Registers and Diffusers 01 - 02

23 81 26 - Split System Air Conditioners 01 - 02
23 81 28.13 - Ductless Split System Heat Pumps (1 to 3½ tons) 01 - 07
23 82 39 - Electric Unit Heaters 01 - 02

DIVISION 26 - ELECTRICAL

26 00 00 - Electrical General 01 - 10
26 05 19 - Conductors 01 - 04
26 05 26 - Grounding 01 - 03
26 05 30 - Firestopping for Electrical Systems 01 - 05
26 05 33 - Conduit and Raceways 01 - 07
26 05 34 - Outlet Boxes and Junction Boxes 01 - 05
26 09 23 - Occupancy Sensors 01 - 05
26 24 16 - Panelboards 01 - 05
26 27 26 - Wiring Devices 01 - 05
26 28 16 - Disconnect Switches 01 - 04
26 32 13 - Emergency Standby Generator System and Switching 01 - 13
26 41 13 - Lightning Protection System 01 - 03
26 43 13 - Surge Protective Devices (SPD) 01 - 03
26 51 00 - Lighting 01 - 03

DIVISION 27 - COMMUNICATIONS

27 00 00 - Communications 01 - 10
27 05 10 - Firestop For Communication Systems 01 - 06
27 05 28 - Pathways For Communication Systems 01 - 09
27 05 43 - Underground Ducts & Raceways For Communication Systems 01 - 07
27 08 00 - Commissioning Of Communications 01 - 04
27 70 10 - Surge Protective Devices 01 - 14

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 05 06 - Access Control System 01 - 08
28 31 11 - Fire Alarm System (Addressable) 01 - 05

DIVISION 31 - EARTHWORK

31 10 00 - Site Clearing 01 - 03
31 22 00 - Earthwork 01 - 05
31 23 00 - Excavation and Fill 01 - 05
31 25 00 - Storm Water Pollution Prevention Plan 01 - 01
31 25 53 - Soil Erosion and Sediment Control 01 - 07
31 31 16 - Termite Control 01 - 03
31 32 13 - Lime Soil Stabilization 01 - 03

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 12 16 - Bituminous Concrete Pavement 01 - 06
32 13 13 - Concrete Paving 01 - 04
32 14 00 - Unit Paving 01 - 06
32 17 00 - Pavement Specialties 01 - 03
32 31 29 - Wood and Composite Fencing 01 - 02
32 84 00 - Planting Irrigation 01 - 24
32 93 00 - Plants 01 - 08

DIVISION 33 - UTILITIES

33 06 00 - Utility Services 01 - 09

END OF SECTION 00 00 10

SECTION 00 00 15 - LIST OF DRAWINGS

G1.0 TITLE SHEET AND DRAWING INDEX
G1.1 MASTER KEYNOTE LIST
G1.3 LIFE SAFETY PLAN

C0.1 BOUNDARY AND TOPOGRAPHIC SURVEY
C1.1 SITE PLAN
C1.2 SITE DETAILS
C1.3 ALTERNATE SITE PLAN
C1.4 GRADING PLAN
C2.0 UTILITY PLAN
C3.0 EXSISTING & PROPOSED DAM
C4.0 EROSION CONTROL PLAN
C5.0 CIVIL DETAILS

L1.1 LANDSCAPE PLAN
L1.2 IRRIGATION PLAN
L1.3 LANDCAPE & IRRIGATION DETAILS

S0.0 STRUCTURAL NOTES
S1.0 DIMENSION CONTROL PLAN
S1.1 FOUNDATION PLAN
S1.2 FIRST FLOOR CLG FRAMING PLAN
S1.3 LOW ROOF FRAMING PLAN
S1.4 HIGH ROOF FRAMING PLAN
S1.5 LATERAL FRAMING PLAN
S1.6 UPLIFT REGIONS
S3.0 SECTIONS
S4.0 ARCH STEEL FRAMES
S4.1 TOWER PLANS
S4.2 STEEL SECTIONS & DETAILS
S5.0 FOUNDATION DETAILS
S5.1 FRAMING DETAILS
S5.2 FRAMING DETAILS
S5.3 LATERAL DETAILS

A1.1 FIRST FLOOR PLAN& PARTITION TYPES
A1.2 FIRST FLOOR DIMENSION PLAN
A1.3 SECOND FLOOR & ENLARGED PLANS
A1.4 PLAN DETAILS
A1.5 ROOF PLAN & DETAILS
A1.6 ROOF DETAILS
A2.1 EXTERIOR ELEVATIONS
A2.2 BUILDING SECTIONS & DETAILS
A3.1 WALL SECTIONS
A3.2 WALL SECTIONS & DETAILS
A3.3 WALL SECTIONS
A3.4 STAIR SECTIONS & DETAILS

A4.1 DOOR SCHEDULE & DETAILS
A4.2 WINDOW TYPES & DETAILS
A5.0 TYPICAL ACCESSIBILITY DETAILS
A5.1 INTERIOR ELEVATIONS
A5.2 MILLWORK SECTIONS
A6.1 REFLECTED CILING PLANS
A6.2 CEILING DETAILS
A7.1 FINISH PLANS & DETAILS
A8.1 FURNISHING & SIGNAGE PLANS

M0.1 MECHANICAL NOTES & SCHEDULES
M0.2 MECHANICAL SCHEDULES
M0.3 MECHANICAL DETAILS
M1.1 FIRST FLOOR MECHANICAL PLAN
M1.2 SECOND FLOOR MECHANICAL PLAN

P0.0 PLUMBING NOTES & SCHEDULES
P0.1 PLUMBING DETAILS & RISERS
P1.0 WATER PLAN
P1.1 WASTE & VENT PLAN

E0.1 ELECTRICAL NOTES & LEGENDS
E0.2 ONE LINE DIAGRAM & SCHEDULES
E1.0 ELECTRICAL SITE PLAN
E1.1 POWER PLAN
E2.1 FIRE ALARM PLAN
E3.1 LIGHTING PLAN

T0.1 TELECOM LEGENDS, DETAILS, & NOTES
T1.0 TELECOM SITE PLAN
T1.1 TELECOM PLAN

END OF SECTION 00 00 15

NOTICE TO PROPOSERS

1. Competitive Sealed Proposals will be received by the City of Los Fresnos, Texas until **2:00 p.m. CST, Thursday, July 12, 2018**, and all bids will be opened and publicly read at the City of Los Fresnos City Hall Council Chambers located at 200 N Brazil St, Los Fresnos, Texas on that date for:

   The Construction of a New City Hall

   Project identification: Project consists of all labor, supervision, materials, services and equipment required in conjunction with all work to construct a new City Hall of approximately 11,000 square feet, as shown on the drawings dated June 11, 2018 and described in the specifications dated June 11, 2018.

2. Bidding forms, specifications, drawings and all necessary information shall be **available only by downloading** from the **Brown Reynolds Watford Architects** website at no charge. The website address is **http://www.brwarch.com**. Access the bidding documents by clicking the **Login** or **Request a Login** link located on the left-hand side of the webpage.

3. Sealed proposals shall be delivered to the City Secretary, City of Los Fresnos, at the City Hall located at 200 N Brazil St, Los Fresnos, Texas 78566 no later than **2:00 p.m. CST, Thursday, July 12, 2018**. Proposals shall be submitted in a sealed envelope clearly marked with the name of the project (Los Fresnos City Hall Proposal) and the proposal opening date, and with the Proposer's name and address in the upper left hand corner of the envelope.

4. A pre-proposal meeting is scheduled to take place at **2:00 p.m. CST, Thursday, June 28, 2018**. This meeting shall be located in the council chambers of City Hall located at 200 N Brazil St, Los Fresnos, Texas. This meeting is not mandatory.

5. All questions regarding the bidding documents shall be submitted to Brown Reynolds Watford Architects in writing. Written questions shall be submitted to Daniel Pesek, Project Architect, at: dpesek@brwarch.com.

6. The right is reserved as the interest of the City may require to reject any and all proposals and to waive any informality in proposals received.

SECTION 00 21 16 - INSTRUCTIONS TO PROPOSERS

PART 1 - GENERAL

1.01 SUMMARY

A. Contract Documents (drawings and specifications) in the form of digital pdf files may be obtained by downloading from the Brown Reynolds Watford Architects website at no charge. The website address is http://www.brwarch.com. Access the bidding documents by clicking the **Login** or **Request a Login** link located on the left-hand side of the webpage. The cost of printing Contract Documents to prepare a proposal and for construction is the responsibility of the Proposer.

B. Proposals must be prepared on the Proposal Form, a sample copy of which is bound into the project manual. All blanks on the Proposal Form must be completed and the Proposals must be dated and signed. Each proposal must be accompanied by a check or bid bond in the amount of 5% of the bid, made payable to the City of Los Fresnos. The Contractor's Qualifications Statement (one original and four copies) must be completed and submitted with the Proposal.

C. Proposals shall be submitted in a sealed envelope clearly marked with the name of the project (Los Fresnos City Hall Proposal) and the proposal opening date (July 12, 2018), and with the Proposer's name and address in the upper left hand corner of the envelope. If forwarded by mail, the sealed envelope containing the Proposal must be enclosed in another envelope addressed to the location stated on the Proposal Form.

D. Proposer may withdraw his Proposal at any time prior to the last date and time specified for submission of Proposals. A Proposer may resubmit his Proposal at any time prior to the deadline for submission of Proposals, pursuant to the Proposal procedures requirements stated herein. Once Proposals are opened, no Proposer may modify or withdraw his Proposal within sixty (60) days after the actual date of the Proposal opening.

E. **Sealed proposals will be received by the City of Los Fresnos Purchasing Department, 200 N Brazil St, Los Fresnos, Texas until 2:00 PM local time, Thursday, July 12, and then publicly opened and read aloud**. Proposal envelopes should be clearly marked with the name of the project (Los Fresnos City Hall Proposal) and the proposal opening date, and with the Proposer's name and address in the upper left hand corner of the envelope.

F. **A non-mandatory Pre-Proposal Conference is scheduled to occur at 2:00 PM on Thursday, June 28 in the City Hall council chamber at 200 N Brazil St, Los Fresnos, Texas**.

G. Proposal is invalid if it has not been received by Owner by the last time and date for receipt of Proposals indicated herein, or prior to any written extension thereof issued to the Proposer. Proposals received after the deadline will be returned unopened.

1.02 REJECTION OF PROPOSALS

A. The Proposer acknowledges the right of the Owner to reject any and all Proposals and to waive any informality or irregularity in any Proposal received. Owner reserves the right to accept or reject any or all Alternates, to accept any combination of Alternates, and to accept any Proposal considered advantageous. Owner shall have all other rights with regard to the Proposal provided by law.

B. In addition, the Proposer recognizes the right of the Owner to reject a Proposal if the Proposer failed to submit the data required by the Proposal Documents, or if the Proposal is in any way incomplete or irregular.

C. The Owner may reject a Proposal due to any irregularity, informality or non-responsiveness, including, but not limited to, any of the following:
   1. Proposals which are not timely submitted.
   2. Proposals which are not signed.
   3. More than one Proposal for same project from an individual, firm, partnership, or corporation.
   4. Proposals containing omissions, alteration of form, additions, qualifications, or conditions not called for by the Owner, or incomplete Proposals may be considered in non-compliance and may be rejected. In any case of ambiguity or lack of clarity in the Proposal, Owner reserves the right to determine the most advantageous Proposal or to reject the Proposal.
   5. Any other cause requiring or permitting rejection under applicable law.

1.03 DISCREPANCIES AND AMBIGUITIES

A. No oral explanation regarding the meaning of the drawings and specifications will be made and no oral instructions will be given before award of the contract. Each Proposer shall examine the Proposal documents carefully and, not later than **seven days prior** to the date for receipt of Proposals, shall make written request to the Architect for interpretation or correction of any ambiguity, inconsistency, or error therein which he may discover. **All written requests shall be directed to Daniel Pesek, Project Architect, at dpesek@brwarch.com**. Any interpretation or correction will be issued as an Addendum by the Architect. Only a written interpretation or correction by Addendum shall be binding. No Proposer shall rely upon any interpretation or correction given by any other method.

B. Prior to the receipt of Proposals, Addenda will be posted electronically on the Architect's website in the same location as the bid documents. It is the obligation of each Proposer to make sure that it has received any and all addenda prior to submitting its Proposal.

1.04 SUBMISSION OF POST-BID INFORMATION

A. Upon request by the Architect/Owner, each Proposer shall, within seven days thereafter, submit any additional information required to evaluate the Proposal, including any information on subcontractors. The Architect/Owner may discuss with any Proposer any subcontractor that Owner has reasonable objection to, or which has been disbarred from performing services for Owner.

1.05 PROPOSER'S ACCEPTANCE OF EVALUATION METHODOLOGY

WAIVER OF CLAIMS: EACH PROPOSER BY SUBMISSION OF A RESPONSE TO THIS REQUEST FOR PROPOSALS ("RFP") WAIVES ANY CLAIMS IT HAS OR MAY HAVE AGAINST THE ARCHITECT, ITS CONSULTING ENGINEERS, OR ANY OTHER CONSULTANTS, AND THEIR RESPECTIVE EMPLOYEES, OFFICERS, MEMBERS, DIRECTORS AND PARTNERS, AND THE OWNER, ITS EMPLOYEES, OFFICERS, AGENTS, REPRESENTATIVES, AND THE MEMBERS OF OWNER'S GOVERNING BODY, CONNECTED WITH OR ARISING OUT OF THIS RFP, INCLUDING THE ADMINISTRATION OF THE RFP AND THE RFP EVALUATION. SUBMISSION OF A PROPOSAL INDICATES PROPOSER'S ACCEPTANCE OF THE EVALUATION TECHNIQUE AND PROPOSER'S RECOGNITION THAT SOME SUBJECTIVE JUDGMENTS MUST BE MADE BY THE OWNER DURING THE EVALUATION OF PROPOSALS, WITHOUT LIMITING THE GENERALITY OF THE FOREGOING. EACH PROPOSER ACKNOWLEDGES THAT THE BASIS OF SELECTION AND THE VALUATIONS SHALL BE MADE PUBLIC AFTER THE CONTRACT IS AWARDED, AND WAIVES ANY CLAIM IT HAS OR MAY HAVE AGAINST THE ABOVE-NAMED PERSONS, DUE TO INFORMATION CONTAINED IN SUCH EVALUATIONS.

1.06 PROPOSAL EVALUATION CRITERIA

A. Following receipt of Proposals, each Proposal will be ranked according to the Proposal Evaluation Criteria within 45 days of the opening date. Owner will select the proposer that demonstrates the best value for the Owner based on the evaluation criteria. The Owner will first attempt to negotiate a contract with the selected proposer. Negotiations may include options for scope or time modification and any related price change. If the Owner is unable to negotiate a contract with the selected proposer, the Owner will, formally and in writing, end negotiations with that proposer and proceed to the next ranked proposer until a contract is reached or all proposals are rejected. The Owner may select representatives to assist in ranking and negotiations. Award of Contract, if any, will be made by formal action of the City of Los Fresnos City Council.

B. Proposal Evaluation Criteria:

• Cost of Construction	50%
• Company Overview and Financial Stability	5%
• Experience and Qualifications of Staff	10%
• Experience with Similar Project Types	10%
• Experience with Local Projects	5%
• Schedule and Ability to Meet Deadlines	5%
• Safety Program and Record	5%
• Quality Assurance Program	5%
• Current Workload and Availability	5%
TOTAL	**100%**

END OF SECTION 00 20 10

SECTION 00 30 00 - INFORMATION AVAILABLE TO BIDDERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 GEOTECHNICAL INVESTIGATION

A. A Geotechnical Investigation for the project site has been performed by Gessner Engineering, LLC, 2501 Ashford Drive, College Station, Texas 77840. A copy of Gessner Engineering's Report (Job No. 17-0424), dated October 17, 2017, is bound herein.

B. Log of borings indicates materials penetrated at specific locations. Owner and/or Architect assume no responsibility for any conclusions of interpretations made by Contractor related to information included in the Report. Should contractor require additional information concerning subsurface conditions, he may without cost to Owner, make additional investigations. Should additional investigations produce information different from that in Soils Report, promptly notify Owner in writing.

C. Contractor shall read and otherwise become completely familiar with contents of Soil Report, including but not limited to its recommendations for preparation of subsoil, bases, sub-bases and fill and construction of building foundations and parking surfaces in compliance with recommendations in Report. Should discrepancy be found between the requirements of Soil Report and the drawings and/or specifications, notify Owner in writing prior to beginning work.

1.03 EXISTING CONDITIONS

A. Bidders shall visit the site of work, review available survey information, and review all conditions affecting the work of this project. Any claims after contract award for difficulties encountered which could have been foreseen by such site review will not be recognized by the Owner.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 00 30 00

Mr. Ray Holliday, AIA
Brown Reynolds Watford Architects
2700 Earl Rudder Freeway South, Suite 4000
College Station, Texas 77845
October 17, 2017

GESSNER
ENGINEERING

GEOTECHNICAL ENGINEERING STUDY

Los Fresnos Municipal Complex
Highway 100
Los Fresnos, Texas
Gessner Engineering Job No. 17-0424

October 17, 2017

GESSNER ENGINEERING

Mr. Ray Holliday, AIA
Brown Reynolds Watford Architects
2700 Earl Rudder Freeway South, Suite 4000
College Station, Texas 77845

Re: Geotechnical Engineering Study
Los Fresnos Municipal Complex
Highway 100
Los Fresnos, Texas
Gessner Engineering Job No. 17-0424

Dear Mr. Holliday:

This report conveys our geotechnical engineering study conducted for the proposed Los Fresnos Municipal Complex located in Los Fresnos, Texas. The following report contains our design recommendations and considerations based on our understanding of the information provided to us. The purpose of this study was to drill borings within the proposed project area, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting foundation design and construction recommendations for the proposed municipal complex, as well as pavement design and construction recommendations. We trust that this report is responsive to your project needs. Please contact us if you have any questions or if we can be of further assistance.

We are happy to be of service to you on this phase of the project and look forward to the opportunity to provide additional geotechnical engineering services, structural services, civil engineering services, land surveying services, and construction materials testing services as the project progresses.

Sincerely,
GESSNER ENGINEERING, LLC F-7451

Kristina M. Surber, E.I.T.

Thomas E. Gessner, P.E.

Copies Submitted:
Mr. Ray Holliday

CONTENTS

CONTENTS 3
INTRODUCTION 4
PROJECT DESCRIPTION 4
SCOPE OF SERVICES 4
SITE INVESTIGATION PROCEDURES 5
LABORATORY TESTING 6
SITE CONDITIONS 8
- Site Geology 8
- Surface Conditions 8
- Subsurface Conditions 8
- Groundwater Conditions 9

ENGINEERING RECOMMENDATIONS 10
- General Foundation Considerations 10
- Foundation Options 11
- Expansive Soil-Related Movements 11
- Structural Slab-on-Voids 12
- Deep Foundations 13
- Earthwork 14
  - Foundation Earthwork 14
  - Site Fill 15
  - Utility Trench Fill 15
- Drainage 15
- Pavement Recommendations 16
  - Subgrade Conditions 16
  - Design Information 16
  - Rigid Pavement 16
  - Portland Cement Concrete 17
  - Flexible Pavement 18
  - Garbage Dumpsters 18
  - Sidewalks 18
  - Flexible Base Course 18
  - Asphaltic Concrete Surface Course 18
  - Subgrade Treatment 19
  - Pavement Earthwork 19
  - Pavement Drainage Considerations 19
- Other Issues 20
- Construction Materials Testing 20
- General Comments 21
- Limitations 21

APPENDIX 22

Introduction

This report briefly describes the procedures utilized during this study and presents the results of our geotechnical engineering study for the proposed Los Fresnos Municipal Complex. Gessner Engineering was authorized to provide the subsurface investigation and report for this project by Mr. Ray Holliday on June 19, 2017.

Project Description

The project consists of the proposed construction of a municipal complex at the site located at Highway 100 in Los Fresnos, Texas, within Cameron County. It is understood that the proposed municipal complex will have a footprint of approximately 10,000 square feet (sf). This project also includes ancillary driveway and parking area pavements. At the time of our study, site grading plans and proposed structural loads were not available. Our understanding of the existing topography at this site is based on Google Earth imagery. Based on this imagery, the topographic high and low within the project site are 24 and 21 feet, respectively.

Scope of Services

The Texas Section of the American Society of Civil Engineers defines an engineered foundation as one that includes a geotechnical engineering investigation. To act as this first phase of an engineered foundation, our scope of work for this project consisted of:

1. Drilling 7 test borings at the selected location within the project site to evaluate the subsurface arrangement of strata and groundwater conditions.

2. Performing geotechnical laboratory tests on recovered samples to evaluate the physical and engineering properties of the strata observed.

3. Engineering analysis to develop design and construction recommendations with respect to:

- Site, subgrade, and fill preparation;
- Foundation design and construction; and
- Pavement design and construction.

SITE INVESTIGATION PROCEDURES

Borings:
4 Borings
Depth: 25 feet
3 Borings
Depth: 5 feet

Subsurface conditions at the site were evaluated by 7 borings drilled at the locations shown on the Project Layout in the Appendix. These locations are approximate and distances were measured using a hand-held, recreational-grade GPS locator; tape; angles; pacing; etc. On September 13, 2017, four borings were drilled to a depth of approximately 25 feet below the existing ground surface and three borings were drilled to a depth of approximately 5 feet below the existing ground surface.

The logs of borings, presenting the subsurface soil descriptions, type of sampling used, laboratory results, and additional field data, are presented in the Appendix. The "Symbols and Terms Used on Boring Logs," which defines the terms and descriptive symbols used on the logs, is also provided in the Appendix.

Samples of soil were obtained by means of a Split-Spoon with Standard Penetration Test (SPT). This test consists of measuring the number of blows required for a free-falling hammer to drive a standard Split-Spoon sampler 12 inches into the subsurface material after being seated 6 inches. The test is terminated after 50 blows regardless of whether 12 inches of penetration has been achieved. If all 50 blows fall within the first 6 inches (seating blows), then refusal (Ref.) for 6 inches or less will be denoted on the logs of borings. This blow count, or SPT "N" value, is used to evaluate the engineering properties of the stratum. Correlations between the unconfined compressive strength and the "N" value for the in situ soils have been developed to estimate the bearing capacity of the soils.

All samples were removed from samplers in the field, visually classified, and sealed in sample containers to preserve their in situ moisture contents.

Throughout the report, the soils are referred to in terms used to describe their consistency. The term consistency refers to the degree of adhesion between the soil particles and to the resistance offered against forces that tend to deform or rupture the soil aggregate. Consistency of clays and other cohesive soils is usually described as very soft, soft, firm, stiff, very stiff, and hard. The correlation between the pocket penetrometer results and these consistency terms are provided on the "Symbols and Terms used on Boring Logs" in the Appendix. Additional consistency terms used on cohesive soils are plastic, lean, and fat. As a soil approaches the characteristics of a clay soil, the greater the variety of states of consistency in which it may be found. A plastic soil changes physical properties depending upon the moisture content of the soil. The degree of plasticity is sometimes expressed by the terms fat and lean. Lean clay is only slightly plastic; whereas fat clay has a high plasticity.

LABORATORY TESTING

Samples obtained during the field program were visually classified in the laboratory by a geotechnical engineer or their representative. A testing program was conducted on selected samples in accordance with the ASTM Standard Test Procedures, as directed by the geotechnical engineer, to aid in classification and evaluation of engineering properties required for analysis.

The laboratory testing program for this project included sieve analyses, moisture contents, and Atterberg limits.

Sieve analyses were performed by passing the sample through a series of sieves to classify the soil based on their particle size. This allows a determination of the type of soils, distribution of the particle sizes and the interaction between the particles. The sieve analysis procedure is outlined in ASTM C 136. Sieves used for this test include a series of screens of various sizes to determine the amount of various particle sizes in a sample.

Moisture content tests were performed in accordance with ASTM D 2216 by placing a sample into an oven with a constant temperature and comparing the mass before oven drying to the mass after oven drying. Changes in the moisture content have an effect on the behavior of plastic soils. Variations in the moisture content from the state observed during investigation to the moisture content from the state observed during construction can result in expansive soil-related movements. If the moisture content of the soil increases after construction, for example, the soil can induce uplift forces on the structure it is supporting.

The structure of clay consists of a random arrangement of flat plates. Edges of the particles are positively charged, and the face is negatively charged. Negative charges on the face of the clays bond with positive water ions in the soil, causing a volumetric change resulting in expansion of the soils. This water may be released with the application of pressure from load, evaporation, or suction from gravity or vegetation. The specific chemical makeup of the various clays causes them to have a stronger or weaker ability to bond with water.

In order to relate moisture content and soil consistency, Atterberg limit tests were performed on the samples in accordance with ASTM D 4318. The Atterberg limit test is comprised of 2 separate tests: plastic limit and liquid limit. The plastic limit test determines the moisture content of the soil in its dry state while the liquid limit test determines the moisture content as the soil nears a liquid state.

The plastic limit is described as the moisture content of the soil where it transitions between brittle and plastic behavior. This point is determined by rolling the samples in threads 1/8 inch (3 mm) in diameter to the point at which they begin to crack and/or crumble.

The liquid limit describes the moisture content of the soil where it transitions between plastic and liquid behavior. In conducting this test, the sample is placed in the Casagrande cup, or liquid limit device. A standard grooving tool is used to create a gap in the center of the sample 0.53 inches (13.5 mm) in width. The cup is then dropped repeatedly onto the hard rubber base at a rate of 120 blows per minute. The liquid limit is the moisture content at which the groove closes at 25 blows.

Liquid Limit Device

The plasticity index (PI) is the difference between the liquid limit and the plastic limit and provides a description of the moisture states a soil can experience. The PI is an indicator of the potential for expansion or contraction of the soil.

Results of the laboratory tests are presented on the logs of borings in the Appendix and are discussed in the following sections. Samples will be retained in our laboratory for 30 days after submittal of this report.

SITE CONDITIONS

Site Geology

Major soil formations provide information with regards to the depth and magnitude of the conditions, as well as anticipated features of the soils in this area. This information provides typical data for the area. While it is valid as a general reference, it does not provide data accurate enough to replace site specific engineering analysis.

The site is likely located in the Alluvium Formation of the Holocene Age in the Quaternary Era as indicated on the Geologic Atlas of Texas, McAllen-Brownsville Sheet as published by the University of Texas at Austin. The Alluvium Formation is composed of floodplain deposits characterized by silt and sand.

Surface Conditions

The project site is a tract of land located at Highway 100 in Los Fresnos, Texas. Based on visual observations, the topography for the proposed municipal complex consists of a gently sloped area with an elevation difference of approximately 3 feet across the proposed building footprint. Ground cover for the proposed site consists of native grass.

Subsurface Conditions

Subsurface stratigraphy at this site can be described by three generalized strata. Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The logs of borings should be consulted for more specific stratigraphic information. Lines designating the interfaces between strata on the logs of borings represent approximate boundaries, and transitions between strata may be gradual.

Stratum I consists of soft to stiff, brown clay. This stratum extends to a depth of approximately 5.5 feet below the existing ground surface of Boring BH-1 and to at least the termination depth of the rest of the borings.

Stratum II consists of stiff, brown sandy clay. This stratum extends to a depth of approximately 10 feet below the existing ground surface of Boring BH-1. This stratum is not encountered in the rest of the borings.

Stratum III consists of loose, brown clayey sand. This stratum extends to at least the termination depth of Boring BH-1. This stratum is not encountered in the rest of the borings.

These soils generally exhibit a low to very high potential for volumetric change due to moisture variations, as indicated by the measured PI for each sample, which are presented in Table 1. Table 1 also contains the in situ moisture contents that correspond to the plastic limits found in each boring. These moisture contents indicate that the soils were generally wet at the time of sampling. Moisture contents are compared to plastic limits to evaluate the conditions within the plastic state for the particular soil, as opposed to absolute values of moisture content.

Shear strengths correlated from the SPT N-values are included in the following table. Another indicator of strength is the friction angle of cohesionless soils, which can be correlated from the SPT in the field. These values are also included in the following table.

Strata #	Soil Description	PI Range	Moisture Content Range (%)	Shear Strength (tsf)	Friction Angle (˚)
I	Clay (CL-CH)	13-59	3% Dry to 18% Wet	0.38 - 1.75	-
II	Sandy Clay (CL)	15	Plastic Limit to 13% Wet	1.50 - 1.63	-
III	Clayey Sand (SC)	8	9 to 13% Wet	-	30

Table 1: Engineering Properties of Each Soil Strata

Groundwater Conditions

The borings were dry augered to their completed depth in an attempt to observe groundwater conditions. Groundwater seepage was observed in the borings at the time of drilling at depths ranging from approximately 9 to 10 feet below the existing ground surface. Upon drilling completion, groundwater was observed in the borings at depths ranging from 11 to 13 feet below the existing ground surface. Borings PH-1, PH-2, and PH-3 remained dry during drilling operations. It should be noted that groundwater at the site may occur in the form of "perched" water traveling along pervious seams or layers within the soils. The frequency of such groundwater is expected to increase during and soon after periods of wet weather. The direction of flow of subsurface moisture is unknown and many times will differ from the surface topography. Caution should be taken when constructing in wet seasons and all water accumulated during construction shall be removed prior to concrete placement.

All samples were returned to our laboratory in Brenham, Texas. Samples not tested in the lab will be stored for a period of thirty (30) days subsequent to submittal of this report and will be discarded after this period, unless Gessner Engineering is notified otherwise. Whenever possible, samples are used to fill subsequently drilled borings, or used to fill washed out areas or holes to prevent adding unnecessary waste to landfills.

General Foundation Considerations

Review of the borings and test data indicates that the factors discussed below may affect foundation design and construction at this site.

Settlement of cohesionless soils is primarily controlled by compressibility, or the tendency of sands to settle or compress under loads. Compressibility is influenced by relative density, grain shape, mineralogy, grain size distribution, overburden pressure, water, precompression or in situ stress state, and cohesive impurities. Relative density and overburden pressure are the primary factors that affect compressibility of soils. Due to the relatively low loads of the structure acting on the in situ soils, overburden pressure is of minimal concern for this project. Settlement due to sands with a low relative density is more of a concern; however, if the site is properly compacted as recommended in the foundation earthwork section of this report, the foundation is expected to experience minimal settlement.

Some soils encountered in our borings are plastic and exhibit expansive soil-related movement properties. Structures constructed on-grade may experience differential movements due to volumetric changes of the underlying and surrounding soils.

Movement of expansive soils is caused by fluctuations in the moisture content of soil particles. Because homogeneous expansive clay soils have relatively low permeability compared to granular soils, fluctuations in the moisture content of the soils might normally be expected to occur over a long period. However, permeability is increased with geotechnical phenomena such as ground faults, surface fractures due to desiccation of clays, and decomposition of tree roots that cause fissures and cracks that become widely disseminated over time.

Due to the repeated wetting, swelling, drying, and shrinking of the clay as it weathers, the fissures often fill with silt and sand, and create pathways for water that can exacerbate the infiltration process. Water can also easily move through naturally occurring sand strata, sand seams, and micro-cracks in clay soil caused by previous shrinkage. High negative pressures, also known as suction, in clay soils with low water content also increase the tendency for water to be absorbed into the clay.

Environmental factors other than climatic conditions can also affect expansive soils. Soil shrinkage may be caused by water extraction by trees and other vegetation, a process known as transpiration. Swelling can be a result of water infiltration into the soil from lawn irrigation systems, broken water pipes, flooded and leaking utility trenches, poor drainage, or leaking swimming pools; or it can be a result of slow moisture replenishment and equalization after the removal of a tree. The combined effect and variability of all of these possibilities make it difficult to accurately predict expansive soil ground movements.

Foundation movements are considered problematic only if they result in negative phenomena that detrimentally affect the performance or appearance of the building. The negative phenomena are considered to be structural if the load carrying capacity of the superstructure or foundation elements are affected, or are considered to be cosmetic if only the appearance of the exterior cladding or interior wall, floor, or ceiling finishes are affected.

Foundation movements can also affect the serviceability of the building, such as the opening or closing of doors. This type of movement typically occurs because of differential movements between various parts of the building. Differential movements often lead to high internal stresses in building

components and subsequent cracking and separating of exterior cladding systems such as brick, cement-board panels, or in the interior finishes such as gypsum drywall panels, wood paneling, and flooring.

Foundation Options

The following recommendation is based on the data obtained from our field and laboratory studies, our past experience with geotechnical conditions similar to those at this site, and our engineering design analyses.

The **structural slab-on-voids foundation system** is the primary recommendation for this site because of its minimal risk for differential movement. This site is characterized by both low plasticity silty clays and very high plasticity clays. The low plasticity soils will exhibit little expansion and contraction. Where the structure spans both high and low plasticity soils, the foundation will experience differential movements if it moves on grade. For this reason, it is the opinion of Gessner Engineering that the amount of site preparation required to enable a slab-on-grade foundation system to perform adequately would be equivalent or in excess of the cost of a slab-on-voids foundation system.

Expansive Soil-Related Movements

Gessner Engineering has calculated the potential vertical rise (PVR) of the soils at this site using the Texas Department of Transportation Method Tex-124-E. Movement may be either heave or settlement depending on the changes in the moisture content. The PVR at this site is calculated to be approximately **5.00 inches**, assuming an active zone of 10 feet. Due to assumptions and generalities required for the calculation of the potential vertical movement, it should only be taken as an approximation. It should be noted that moisture variations in the subgrade soils due to poor drainage, perched water in pervious layers, leakage of utilities, etc. could induce volumetric changes resulting in movements that are in excess of those estimated by the PVR procedure.

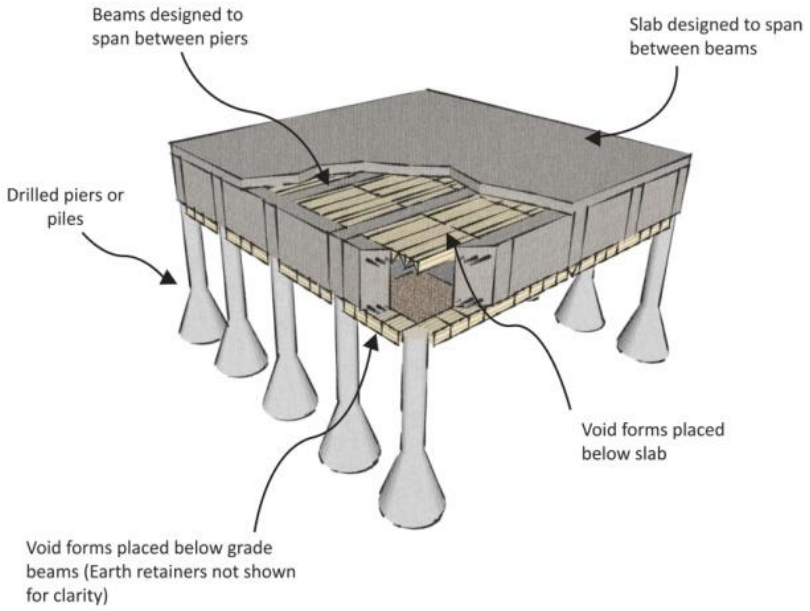
To reduce the expansive soil-related movements in at-grade construction, a portion of the subgrade soils within the proposed building area can be overexcavated and backfilled with a suitable select fill material. The table below summarizes estimated values for PVR corresponding to various depths of overexcavation and select fill replacement. Estimated PVR values for additional feet of surcharge are also included to account for adjustments to PVR for the site being built up to meet the finished grade elevation. If depths of surcharge greater than 2 feet are anticipated, GE should be contacted to provide additional recommendations. The owner, the contractor, and the engineer should discuss the necessary PVR value and corresponding depths of overexcavation and select fill replacement for this project. The presence of sand, which is carrying seasonal water, may increase the estimated soil heave and is not considered in this calculation. Due to the excessive amount of overexcavation and select fill replacement needed to achieve acceptable PVR values, it is recommended that a slab-on-voids foundation system be used to support the proposed foundation.

Depth of Overexcavation and Select Fill Replacement (feet)	Estimated PVR for 0 Feet of Surcharge Addition (inches)	Estimated PVR for 1 Foot of Surcharge Addition (inches)	Estimated PVR for 2 Feet of Surcharge Addition (inches)
0	5.00	4.50	4.00
2	3.75	3.25	3.00
4	2.75	2.50	2.15
6	2.00	1.75	1.50
8	1.25	1.00	< 1.00
10	1.00	< 1.00	< 1.00

Table 2: Estimated PVR Corresponding to Various Depths of Overexcavation and Select Fill Replacement

Structural Slab-on-Voids

A structural slab isolates the foundation from the soils through the use of void forms, a crawl space, or another method. These foundations are typically employed when the amount of site preparation required to reduce the PVR value to acceptable levels for a slab-on-grade foundation system would be equivalent or in excess of the cost of a slab-on-void system or when a structure is sensitive to movement. The principle behind structural elevated foundation systems is to found the structure on deep, stable soils or rock that is unlikely to be affected by seasonal changes to the shallow soils. The deep founding elements are typically piles or piers. The floor system is constructed above the shallow soils. This isolation from the surficial soils prevents damages caused by periodic shrinkage and heave of expansive clays.



The minimum amount of soil separation between the shallow foundation elements and the subgrade shall be **8 inches**. Shallow soils at site have sufficient cohesion to remain stable during excavation of earth formed grade beams. Grade beam width and depth should be properly evaluated by the structural engineer and designed to span from pier to pier. It is also recommended that a vapor barrier be placed between the supporting soils and the concrete floor slab in accordance with ASTM E 1745-11, ASTM E 1643-11, and ACI 302.2R-06. Piers shall be designed in accordance with the *Deep Foundations* section of this report.

For the long term effectiveness of void systems, earth retainers shall be employed to protect the void. Where an interior crawl space is provided or the interior soils and fill have sufficient cohesion to remain open, perimeter earth retainers may be used. Earth retainers shall be placed with a secure overlap against a formed concrete surface and keyed into firm soil to provide adequate support at the top and bottom of the retainer against lateral earth pressure. In full slab on void systems, it is recommended that earth retainers be installed on both sides of beams and excavations. This installation protects against interior collapses where soils have been disturbed by construction activities. The retainers may be placed in a manner similar to that for exterior earth retainers as described previously, or may be set prior to the pour. Should the earth retainers be set prior to the pour, they shall be either keyed into the soil below to provide support at top and bottom or be designed and supported to cantilever over the void. Cantilevered earth retainers typically require a more rigid earth retainer and extend up the grade beam a minimum distance of twice the void depth.

In foundations with crawl spaces, adequate ventilation and drainage in accordance with code requirements should be provided to minimize moisture accumulation within the crawl space.

Care should be taken in all foundation systems to provide adequate drainage around the structure and prevent ponding of runoff adjacent to the foundation. In addition, systems that extend from the building into the shallow soils such as plumbing should be designed to accommodate the movement of the shallow soils.

Subgrade for the structural slab foundation system shall be prepared in accordance with the foundation portion of the soil preparation section of this report.

Deep Foundations

Based on the current available project information and the soils data obtained, the foundation shall be supported on augered cast-in-place (ACIP) piles. ACIP piles mobilize skin friction to distribute the loads from the proposed structures to the subsoil. ACIP piles are the best option for this foundation due to the low cohesion of soils in some areas as well as the shallow groundwater encountered in the borings. For these reasons, the soils may cave if the traditional drilled piers are used.

ACIP piles can be drilled in varying sizes ranging from 12 to 30 inches. We recommend that the diameter of augered cast-in-place piles be a 16 to 18 inch pile and that pile diameter changes be limited to minimize the cost of rigging down and back up for multiple sizes. ACIP piles should be designed as friction units using an allowable side shear resistance capacity of **130 psf** for the portion of the shaft extending below a depth of 10 feet below the existing ground surface. We recommend that the piles extend to a minimum of depth of **18 feet**. This allowable side shear resistance was evaluated using a calculated factor of safety of at least 2. Based on the 25-foot maximum depth of exploration, pile depths should not exceed a depth of 23 feet below the ground surface existing at the time of our study.

Reinforcing steel will be required in each pile to withstand a net force equal to the uplift force minus the sustained compressive load carried by that pier. Typical reinforcing steel for an ACIP pile consists of a single central bar designed to carry uplift loads that runs the full length of the pile to maintain continuity. This reinforcement also helps to limit shrinkage cracking and to transmit axial load across sections where inadequate grout strength may have been formed during installation of the pile. A cage of reinforcement, which is generally designed for lateral load, can be inserted after placement of grout, but it should be detailed so that vertical bars are bent to nearly meet at a point at the bottom of the cage to help insure that soil is not mixed with grout during insertion of the cage. The cage should be fitted with spacers, heavy enough to hold the reinforcment away from the sides of the hole, to help assure required cover. Light plastic wheels often used for this purpose are unacceptable. We recommend that heavy spacer wheels such as ShaftSpacer, manufactured by Foundation Technologies, be used. Mix fluidity will need to be designed to facilitate rebar insertion and may also need to be adjusted for this purpose during construction.

ACIP piles should be designed, constructed, and inspected in accordance with the recommendations of the Federal Highway Administration (FHWA) publication GEC #8 *Design and Construction of Continuous Flight Auger Piles,* 2007.

Earthwork

During earthwork, best practices shall be applied to limit erosion and pollution by sedimentation. At all times, the contractor shall work to maintain natural drainage and prevent the accumulation of runoff.

To achieve the required moisture content, the following recommendations are included as an aid to contractors. Where subgrade or layer of soil material requires moisture before compaction, uniformly apply water to surface of subgrade. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to achieve compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value. Alternate methods to achieve the end result of specified moisture content and compaction may also be used.

Four different methods may be utilized to successfully compact the soil. They include the processes of static weight, kneading action, impact, or vibration. Soil must be compacted using a compactor in accordance with the ASTM standards. A compactor is required to compact the soil to such a large degree. Track equipment such as bull dozers apply pressure across a large surface area and are therefore limited in their capabilities compared to a compactor. If the select fill is not compacted properly, the fill material and structures constructed on it are subject to settlement.

Foundation Earthwork

The following earthwork recommendations are provided for the design parameters as described previously in the report. For a **structural slab-on-voids foundation system** at this site, it is recommended that a minimum of **6 inches** of existing material be overexcavated and general fill be compacted in place as needed to form a level building pad. The building pad shall extend a minimum of

Earthwork:

Structural Slab-on-Voids

- Overexcavate 6 inches of existing material
- Replace with compacted general fill as needed

5 feet from the edge of the site footprint in all directions. Select fill shall slope away at an angle that allows for proper drainage (see *Drainage* section).

General fill to be used beneath a structural slab-on-voids shall have a PI no greater than 30 and shall be free of debris and organics. All general fill should be placed on prepared surfaces in lifts not to exceed 8 inches loose measure, with compacted thickness not to exceed 6 inches. General fill should be compacted to at least 92 percent of the Standard Proctor (ASTM D 698) density at a moisture content ranging within 2 percent of optimum moisture content.

Construction areas should be stripped of all vegetation, loose topsoil, surficial concrete, etc. Roots of trees to be removed within construction areas should be excavated and removed from the construction area. Once final subgrade elevation has been achieved, exposed soil subgrade areas shall be proofrolled with a 15 ton roller (minimum) or equivalent equipment as approved by the engineer to detect weak zones. Weak areas detected during the proof rolling process, as well as zones containing debris and/or organics and voids resulting from removal of tree roots, etc., should be removed and replaced with soils exhibiting similar classification, moisture content, and density as the adjacent in situ soils. Finally, the minimum amount of select fill shall be placed to evenly build up the pad. Select fill amounts may be increased to raise the building pad to the desired finished floor elevation or to decrease the movement potential of the site.

Site Fill

For site areas not below pavements or ground-supported structures, general fill may be used to achieve the desired grade.

A surficial backfill material within 5 feet of the foundation perimeter for the top foot of soil may be installed as a clay cap on fill materials to prevent migration of surface water beneath the structure. This material shall be placed as noted for general fill above and shall have a PI in excess of 30. Fill shall be free of debris and organics and shall be placed in accordance with the *Drainage* section of this report.

Utility Trench Fill

The upper portion of utility excavations should be backfilled with properly compacted clay soils to minimize infiltration of surface water. A clay “plug” should be provided in the trench on the exterior of the building to prevent water from gaining access along the trench to the subgrade beneath the structure. This plug shall extend 2 feet beyond the pipe face in all directions and be a minimum of 2 feet thick.

Drainage

The performance of the foundation system for the proposed municipal complex will not only be dependent upon the quality of construction, but also upon the stability of the moisture content of the near surface soils. Therefore, Gessner Engineering recommends that site drainage be developed so that ponding of surface runoff near the structure does not occur. Accumulation of water near the structure foundation may cause moisture variations in the soils adjacent to the foundation, thus increasing the potential for structural distress.

Slope adjacent to foundations is addressed in section 1803 of the International Building Code, which requires a 5 percent slope in the first 10 feet. Where sites do not allow this, the code allows drainage

structures to accommodate the runoff. It should be noted that this requirement conflicts with accessibility standards, which would govern at entrances and other travel paths.

Pavement Recommendations

Recommendations for both flexible and rigid pavements are presented in this report. The Owner and/or design team may select either pavement type depending on the performance criteria established for the project. In general, flexible pavement systems have a lower initial construction cost as compared to rigid pavements. However, maintenance requirements over the life of the pavement are typically much greater for flexible pavements. This typically requires regularly scheduled observation and repair, as well as overlays and/or other pavement rehabilitation at approximately one-half to two-thirds of the design life. Rigid pavements are generally more durable and require less maintenance after construction.

For either pavement type, drainage conditions will have an impact on long term performance, particularly where permeable base materials are utilized in the pavement section. Pavement design should be in accordance with the *Pavement Drainage Considerations* section of this report.

Subgrade Conditions

Gessner Engineering assumes that the subgrade in pavement areas will consist of the recompacted on-site materials, placed and compacted as recommended in the *Pavement Earthwork* section of this report. Based on our experience with similar subgrade soils, a California Bearing Ratio (CBR) value of 3.0 has been assigned for use in pavement thickness design analyses.

Design Information

The following recommendations were prepared assuming a 20-year design life and Equivalent Single Axle Loads (ESAL's) of 15,000 for light duty pavements (parking areas) and 50,000 for heavy duty pavements (main drives). This traffic frequency is approximately equivalent to 1 and 3 tractor-trailer trucks per day for a design period of 20 years for light and heavy duty pavements, respectively. **The Project Civil Engineer should review anticipated traffic loading and frequencies to verify that the assumed traffic loading and frequency is appropriate for the intended use of the facility.**

Rigid Pavement

It is recommended that rigid pavements be considered in areas of channelized traffic, particularly in areas where truck or bus traffic is planned, and particularly where such traffic will make frequent turns, such as garbage dumpsters as described in the garbage dumpsters section of this report.

For the concrete parking lots, sidewalks and drives, frequent control joints should be used to direct shrinkage cracking with a maximum joint spacing as shown in the table below. It should be noted that the pavement thicknesses listed are minimum recommendations only and are not based on a pavement system design. Expansion joints shall be placed at anticipated stress points and dowels shall be placed across these joints. The concrete section may be reinforced and designed in accordance with ACI standard practices or may be designed as a jointed system in accordance with ACI 330R-08.

Loading	Concrete Thickness (inches)	Control Joint Maximum Spacing (feet)
Sidewalks	4	Sidewalk Width
Parking Areas	5	10
Main Drives	7	14

Table 3: Rigid Pavement System Recommendations

It is recommended that the concrete pavements be reinforced with bar mats. Concrete reinforcing should be placed approximately 1/3 the slab thickness below the surface of the slab, but not less than 2 inches. In thinner slabs, the reinforcement should be centered in the slab. Reinforcing should not extend across expansion joints.

All control joints should be formed or sawed to a depth of at least 1/4 the thickness of the concrete slab. Sawing of control joints should begin as soon as the cutting can be performed without raveling of the concrete. Control joints may be hand formed or formed by using a premolded filler. It is recommended that all longitudinal and transverse construction joints be dowelled to promote load transfer. Expansion joints are needed to separate the concrete slab from fixed objects such as drop inlets, light standards and buildings. No expansion or construction joints should be located in a swale or drainage collection locations.

The minimum area of steel required for a reinforced section shall be computed by the drag formula:

Formula 1: Drag Formula

$$A = \frac{\left(LC_f wh\right)}{24 f_s}$$

Where:

A = area of steel reinforcement (in^2/ft)
L = distance between joints (ft)
C_f = Coefficient of subgrade resistance (use 1.5)
w = density of concrete (lb/ft^3)
h = slab thickness (in)
f_s = allowable tensile stress in steel reinforcement (psi)

If possible, the pavement should develop a minimum slope of 0.015 feet/feet to provide surface drainage. Reinforced concrete pavement should cure a minimum of 3 and 7 days before allowing automobile and truck traffic, respectively.

Portland Cement Concrete

Portland cement concrete should be air entrained to result in a 4 percent plus/minus 1 percent air, should have a maximum slump of 5 inches, and should have a minimum 28-day compressive strength of 4,000 psi. A liquid membrane-forming curing compound should be applied as soon as practical after broom finishing the concrete surface. The curing compound will help reduce the loss of water from the concrete. The reduction in the rapid loss in water will help reduce shrinkage cracking of the concrete.

The M_r of concrete is a measure of the flexural strength of the concrete as determined by breaking concrete beam test specimens. A M_r of approximately 450 to 550 psi at 28 days was used in the analysis and is typical of local concrete production.

Flexible Pavement

Flexible pavement sections recommended for this site are as listed in the table below:

Layer Material	Parking Areas	Main Drives
	Material Thickness (inches)	Material Thickness (inches)
Asphaltic Concrete	2.0	2.5
Crushed Limestone Base	8.0	8.0
Chemically Stabilized Subgrade	6.0	6.0

Table 4: Flexible Pavement System Recommendations

Garbage Dumpsters

Where flexible pavements are constructed at any site, it is recommended that reinforced concrete pads be provided in front of and beneath trash receptacles. Dumpster trucks, if any, should be parked on the rigid pavement when trash receptacles are lifted.

It is suggested that such pads also be provided in drives where the dumpster trucks make turns with small radii to access the receptacles. Concrete pads at this site should be a minimum of 6 inches thick and reinforced with conventional steel reinforcing bars.

Sidewalks

Concrete sidewalks are planned throughout the facility for pedestrian traffic. It is recommended that subgrade stabilization be extended beneath sidewalks to reduce movement that would interfere with required ADA specifications. Reference the concrete and subgrade sections below for details.

Flexible Base Course

Flexible base course should be crushed limestone conforming to TxDOT Standard Specifications, Item 247, Type A, Grades 1 or 2. Base course should be placed in lifts with a maximum thickness of 8 inches and compacted to a minimum of 95 percent of the maximum density at a moisture content within the range of 2 percentage points below to 2 percentage points above the optimum moisture content as determined by Tex-113-E.

Asphaltic Concrete Surface Course

Asphaltic concrete surface course should conform to TxDOT Standard Specifications, Item 340, Type D. Asphaltic concrete should be compacted to a minimum of 92 percent of the maximum theoretical specific gravity (Rice) of the mixture determined according to Test Method Tex-227-F. Pavement specimens, which shall be either cores or sections of asphaltic pavement, will be tested according to Test Method Tex-207-F. The nuclear-density gauge or other methods that correlate satisfactorily with results obtained from project roadway specimens may be used when approved by the Engineer. Unless otherwise shown on the plans, the Contractor shall be responsible for obtaining

the required roadway specimens at their expense and in a manner and at locations selected by the Engineer.

Subgrade Treatment

Gessner Engineering recommends the use of cement stabilizer for the treatment of the clay subgrade to help enhance the support characteristics of the subgrade. Subgrade shall be treated to a depth resulting in a 6 inch thick subgrade. Subgrade should be treated with cement meeting the requirements of TxDOT 2004 Standard Specifications Item 275. Cement treatment shall be accomplished such that a uniform subgrade mix is obtained. Prior to the application of cement to the subgrade, the optimum percentage of cement to be added should be determined based on compressive strength tests on samples with varying percent cement and prepared in accordance with TEX-120-E. The required cement selected shall provide a minimum strength of 50 psi. Cement shall be uniformly spread and mixed into the subgrade prior to the application of water. Stabilization shall be mixed and compacted in 1 lift and shall be completed the same day.

It is important that proper perimeter drainage be provided so that infiltration of surface water from unpaved areas surrounding the pavement is minimized, or if this is not possible, curbs should extend through the base and into the subgrade. A crack sealant compatible to both asphalt and concrete should be provided at concrete-asphalt interfaces. It should be noted that post-construction subgrade movements and cracking of asphaltic pavements is not uncommon for subgrade conditions such as those observed at this site.

Pavement Earthwork

If required, fill used beneath pavement shall have a PI between 8 and 30. Any fill beneath pavement shall be compacted to a minimum of 95 percent of the maximum density as determined by the modified moisture/density relation (ASTM D 1557) at -2 to +2 percent of the optimum moisture content. (As an alternative, compaction to at least 98 percent of the ASTM D 698 maximum dry density may be considered). The top portion of fill shall be chemically stabilized as recommended in the *Subgrade Treatment* section of this report.

Pavement Drainage Considerations

As with any soil-supported structure, the satisfactory performance of a pavement system is contingent on the provision of adequate surface and subsurface drainage. Insufficient drainage that allows saturation of the pavement subgrade and/or the supporting granular pavement materials will reduce the performance and service life of the pavement systems.

Surface and subsurface drainage considerations crucial to the performance of pavements at this site include (but are not limited to) the following:

1) Any known natural or man-made subsurface seepage at the site that may occur at sufficiently shallow depths as to influence moisture contents within the subgrade should be intercepted by drainage ditches or below grade French drains.

2) Final site grading should eliminate isolated depressions adjacent to curbs which may allow surface water to pond and infiltrate into the underlying soils. **Curbs should completely penetrate subgrade materials and should be installed to sufficient depth to reduce infiltration of water beneath the curbs.**

3) Pavement surfaces should be maintained to help minimize surface ponding and to provide rapid sealing of any developing cracks. These measures will help reduce infiltration of surface water downward through the pavement section.

Other Issues

Large trees adjacent to the foundation should be avoided, as they can affect soil moisture contents significantly by creating concentrations of dry soils around the trees. If trees adjacent to the foundation cannot be avoided, property owners should maintain the drip line of the trees, which is typically consistent with the root system and can help keep the root system from causing foundation issues.

Maintenance of the entire landscape is a good practice for maintaining consistent moisture contents and minimizing foundation movement. Proper landscape maintenance uses vegetation as a natural moisture content indicator, as both over and under watering will result in distress of the plants.

Any elements that can affect the moisture content of the soils supporting the foundation, such as pools or plumbing, pose a risk to stiffened slab-on-grade foundations. Care should be taken to prevent and quickly repair any leaks to minimize damage to the foundation.

Care should be taken when constructing adjacent to slopes to prevent bearing capacity failure due to nearby slope failure. For slopes steeper than 1 to 1, section 1808.7.2 of the 2012 International Building Code recommends a minimum set back from slopes of 15 feet or one-half the height of the slope.

Construction Materials Testing

The performance of foundation systems and pavements are dependent upon the quality of construction. Compaction testing of fill material and concrete strength tests are required by the International Building Code. Therefore, it is recommended that Gessner Engineering monitor the foundation installation to identify the proper founding strata and depths and to help evaluate building pad and foundation construction. We would be pleased to develop a plan for foundation monitoring to be incorporated in the overall quality control program. For more information, please contact Gessner Engineering's dedicated dispatch number for materials testing at 979-325-TEST (8378).

General Comments

Shallow foundation excavations should be observed by the Geotechnical Engineer or their representative prior to placement of reinforcing steel and concrete. This is necessary to observe that the founding soils at the bottom of the excavations are similar to those encountered in our borings and that excessive loose materials and water are not present in the excavations. If soft pockets of soil are encountered in the foundation excavations, they should be overexcavated and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevations. Gessner Engineering would be pleased to provide foundation design review, foundation inspection prior to the concrete pour, and construction materials testing.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, Gessner Engineering should be immediately notified so that further evaluation and supplemental recommendations can be provided.

Limitations

The scope of services for this project does not include, either specifically or by implication, any environmental or biological (e.g., mold, fungi, and bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

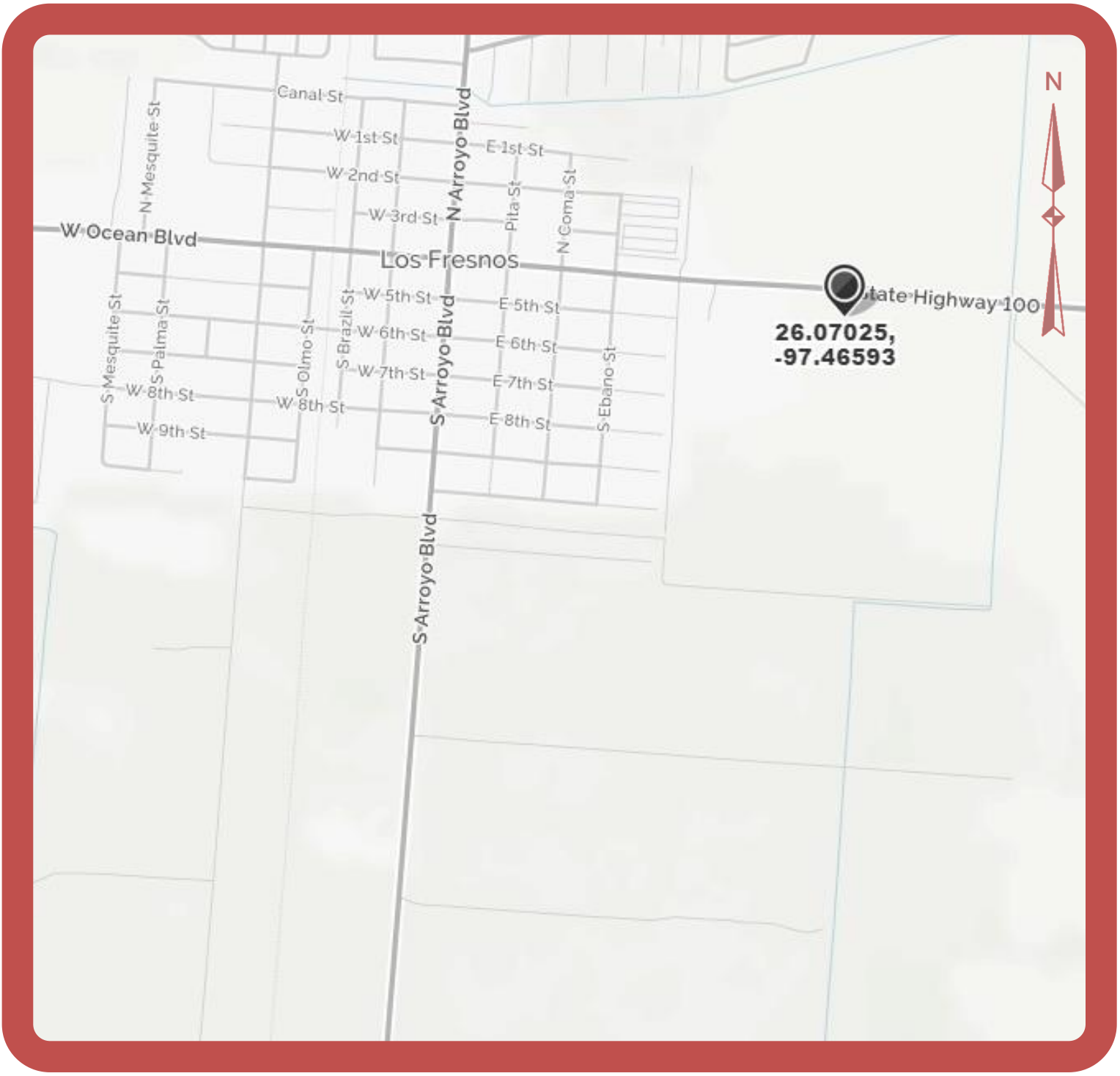
For any excavation construction activities at this site, all Occupational Safety and Health Administration (OSHA) guidelines and directives should be followed by the Contractor during construction to ensure a safe working environment. In regards to worker safety, OSHA Safety and Health Standards require the protection of workers from excavation instability in trench situations.

This report has been prepared for the use of Mr. Ray Holliday, AIA, with Brown Reynolds Watford Architects and his design representatives for the specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. This report was written and recommendations were made based on the soil data collected on September 13, 2017. If construction is delayed or the proposed area experiences severe weather conditions, please contact the geotechnical engineer prior to construction. No warranties, either expressed or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Gessner Engineering reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX

- ✓ Project Location
- ✓ Project Layout
- ✓ Logs of Borings
- ✓ Symbols and Terms Used on Boring Logs
- ✓ Glossary of Geological Terms

Mobile B-37 Drill Rig: Bubba Red



GESSNER ENGINEERING

LOS FRESNOS MUNICIPAL COMPLEX

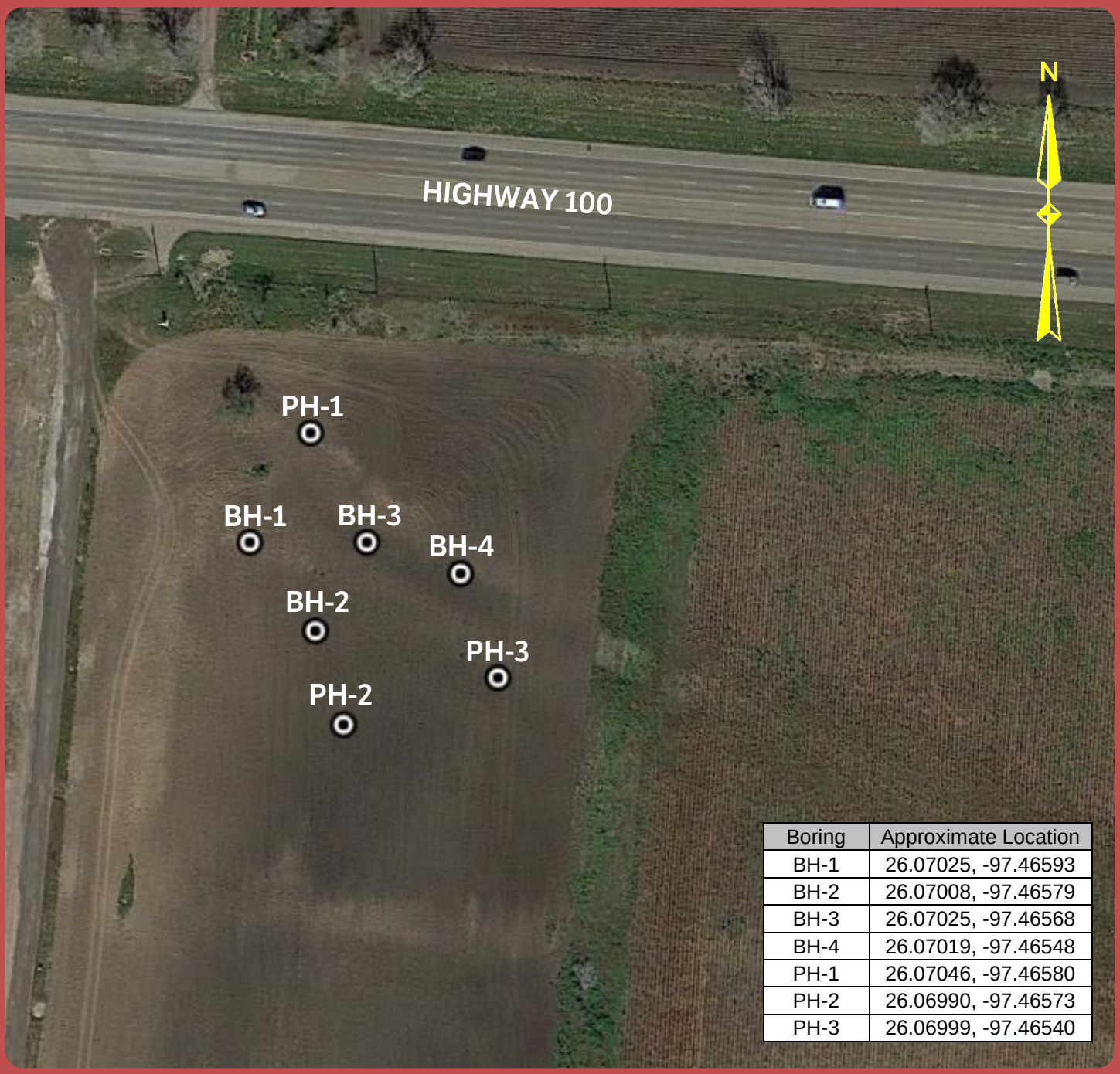
HIGHWAY 100
LOS FRESNOS, TEXAS

PROJECT LOCATION

2501 Ashford Drive | College Station, Texas 77840
www.gessnerengineering.com |979.680.8840
College Station | Brenham | Fort Worth | San Antonio

TBPLS F-1093910 — PLAN | DESIGN | VERIFY — TBPE F-7451

Scale:	NTS
Job No.	17-0424
Drawn By:	AKM
Checked By:	KMS
Drawn Date:	10.10.17
Drawing No.	1



Boring	Approximate Location
BH-1	26.07025, -97.46593
BH-2	26.07008, -97.46579
BH-3	26.07025, -97.46568
BH-4	26.07019, -97.46548
PH-1	26.07046, -97.46580
PH-2	26.06990, -97.46573
PH-3	26.06999, -97.46540

GESSNER ENGINEERING
2501 Ashford Drive | College Station, Texas 77840
www.gessnerengineering.com |979.680.8840
College Station | Brenham | Fort Worth | San Antonio
TBPLS F-1093910 PLAN | DESIGN | VERIFY TBPE F-7451

LOS FRESNOS MUNICIPAL COMPLEX

HIGHWAY 100
LOS FRESNOS, TEXAS

PROJECT LAYOUT

Scale:	NTS
Job No.	17-0424
Drawn By:	IDG
Checked By:	KMS
Drawn Date:	10.08.17
Drawing No.	2

GESSNER ENGINEERING

LOG OF BORING NO: BH-1

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.07025, -97.46593
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	22 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	25 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	9 feet
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	13 feet
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	15.75 feet
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				5/5/6			13.2					CLAY, Firm to Stiff, Brown
				5/4/4	38	25	12.3		95		CL	
5				5/4/3			10.5					
	▽			5/5/7	26	15	24.4		69		CL	CLAY, Sandy, Stiff, Brown
10				6/7/6			22.6					
	▼											SAND, Clayey, Loose, Brown
15				2/2/4	20	8	24.5		37		SC	
20				3/3/5			25.2					
25				3/4/4	23	10	21.9		42		SC	

GESSNER ENGINEERING

LOG OF BORING NO: BH-2

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.07008, -97.46579
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	22 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	25 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	Not Encountered
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	11.25 feet
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	14.67 feet
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0												CLAY, Soft to Stiff, Brown
				3/6/8	47	32	12.5		99		CL	
				2/2/3			15.5					
5				3/2/3	31	17	23.8		99		CL	
				2/1/2			26.5					
10				2/2/2	31	18	27.8		93		CL	
	▼											
15				3/2/2			27.8					
20				2/2/2	27	13	30.2		79		CL	
25				1/1/2			29.7					

GESSNER ENGINEERING

LOG OF BORING NO: BH-3

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.07025, -97.46568
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	22 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	25 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	10 feet
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	12.25 feet
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	15.83 feet
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				4/4/5			18.4					CLAY, Soft to Stiff, Brown
				3/3/4	34	21	18.4		96		CL	
5				4/4/3			20.3					
				3/2/2	28	15	27.6		85		CL	
10	▽			2/1/2			26.7					
	▼											
15				3/3/5	29	15	26.4		85		CL	
20				3/3/4			24.2					
25				4/4/3	25	14	25.6		68		CL	

GESSNER ENGINEERING

LOG OF BORING NO: BH-4

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.07019, -97.46548
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	24 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	25 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	9.5 feet
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	13 feet
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	16.08 feet
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				5/6/7	80	59	19.7		99		CH	CLAY, Firm to Stiff, Brown
				4/4/5			25.7					
5				5/4/6	76	58	27.6		99		CH	
				6/5/5			24.0					
10	▽			5/4/5	56	40	21.0		99		CH	
	▼											
15				3/4/3			30.3					
20				2/3/3	34	21	31.3		92		CL	
25				4/3/3			22.4					

LOG OF BORING NO: PH-1

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.07046, -97.46580
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	22 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	5 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	Not Encountered
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	Dry at Completion
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	Not Caved
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				4/6/7			19.7					CLAY, Stiff, Brown
5				5/5/8	65	48	22.9		99		CH	

GESSNER ENGINEERING

LOG OF BORING NO: PH-2

CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.06990, -97.46573
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	22 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	5 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	Not Encountered
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	Dry at Completion
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	Not Caved
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				4/4/5	63	44	20.7		99		CH	CLAY, Stiff, Brown
5				4/6/8			21.0					

GESSNER ENGINEERING

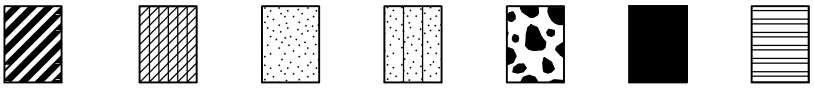
LOG OF BORING NO: PH-3

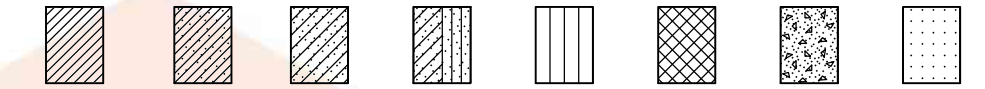
CLIENT:	Brown Reynolds Watford Architects	**BOREHOLE LOCATION:**	26.06999, -97.46540
PROJECT:	Los Fresnos Municipal Complex	**GROUND SURFACE ELEVATION:**	21 feet
	Highway 100	**BOREHOLE TERMINATION DEPTH:**	5 feet
	Los Fresnos, Texas	**INITIAL GROUNDWATER DEPTH:**	Not Encountered
PROJECT NO:	17-0424	**FINAL GROUNDWATER DEPTH:**	Dry at Completion
DATE:	9/13/2017	**BOREHOLE CAVED DEPTH:**	Not Caved
DRILLER:	Earth Co	***ALL DEPTHS, ELEVATIONS, AND LOCATIONS ARE APPROXIMATE**	

DEPTH (ft)	WATER LEVEL	GRAPHIC LOG	SAMPLE TYPE	PENETROMETER OR BLOW COUNT	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	FINES CONTENT (%)	UNCONFINED COMPRESSION (tsf)	USCS CLASSIFICATION	MATERIAL DESCRIPTION
0				3/6/6			16.7					CLAY, Firm to Stiff, Brown
5				3/3/3	28	16	17.2		91		CL	

SYMBOLS AND TERMS USED ON BORING LOGS

SOIL SYMBOLS AND DESCRIPTION





SAMPLER TYPES

GROUNDWATER SYMBOLS AND DESCRIPTION

▽ - GROUNDWATER ENCOUNTERED DURING DRILLING

▼ - GROUNDWATER DEPTH UPON DRILLING COMPLETION

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (Major Portion Retained on No. 200 Sieve): Includes (1) clean gravels and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

Standard Penetration, N-Value, blows/ft	Relative Density
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
>50	Very Dense

FINE GRAINED SOILS (Major Portion Passing No. 200 Sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy, or silty clays; and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

Standard Penetration, N-Value, blows/ft	Pocket Penetrometer Reading	Consistency	Cohesive Strength, tons/sf
0-2	0-0.25	Very Soft	less than 0.125
2-4	0.25-0.5	Soft	0.125 to 0.25
4-8	0.5-1.0	Firm	0.25 to 0.50
8-15	1.0-2.0	Stiff	0.50 to 1.00
15-30	2.0-4.0	Very Stiff	1.00 to 2.00
>30	>4.0	Hard	2.00 and higher

Note: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above due to planes of weakness or cracks in the soil.

EXPANSION POTENTIAL OF COHESIVE SOILS

Plasticity Index	Degree of Expansive Potential
0-5	Nonplastic
5-10	Low
10-20	Moderate
20-40	High
>40	Very High

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	- having inclined planes of weakness that are slick and glossy in appearance
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical
Laminated	- composed of thin layers of varying color and texture
Interbedded	- composed of alternate layers of different soil types
Calcareous	- containing appreciable quantities of calcium carbonate
Well graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly graded	- predominantly of one grain size, or having a range of sizes with some intermediate size missing
Flocculated	- pertaining to cohesive silts that exhibit a loose knit or flakey structure

GLOSSARY OF GEOLOGIC TERMS

Aphanitic - dense, homogeneous rock with constituents so fine that they cannot be seen by the naked eye

Argillaceous - containing, made of, or resembling clay; clayey

Bentonitic - an absorbent aluminum silicate clay formed from volcanic ash and used in various adhesives, cements, and ceramic fillers

Carbonaceous - consisting of, containing, relating to, or yielding carbon

Chert - a siliceous rock of chalcedonic or opaline silica occurring in limestone

Conchoidal - of, relating to, or being a surface characterized by smooth, shell-like convexities and concavities, as on fractured obsidian

Crossbedded - intersecting layers of distinct soil deposits

Fluviatile - produced by the action of a river or stream

Fossiliferous - containing fossils

Friable - readily crumbled, brittle

Glauconitic - a greenish mineral of the mica group, a hydrous silicate of potassium, iron, aluminum, or magnesium found in *greensand* and used as a fertilizer and water softener

Gypsiferous - containing gypsum; a widespread colorless, white, or yellowish mineral, used in the manufacture of various plaster products, and fertilizers

Igneous - rocks formed by solidification from a molten state; pyrogenic

Inclusion - a solid, liquid, or gaseous foreign body enclosed in a mineral or rock.

Indurated - hardened soil that has been changed by extreme climate

Laminated - a soil deposit divided into thin layers

Lateritic - pertaining to red residual soil in humid tropical and subtropical regions that is leached of soluble minerals, aluminum hydroxides, and silica but still contains concentrations of iron oxides and iron hydroxides.

Lenticular - lens-shaped grains of soil or rock

Lignitic - pertaining to soft, brownish-black coal in which the alteration of vegetable matter has proceeded further than in peat but not as far as in bituminous coal; also called *brown coal*

Marl - a loose and crumbling earthy deposit consisting mainly of calcite or dolomite; used as a fertilizer for soils deficient in lime

Metamorphic - rocks changed in structure or composition as a result of metamorphism caused by chemical reaction or heat and pressure

Micaceous - containing mica; any of a group of chemically and physically related aluminum silicate minerals, common in igneous and metamorphic rocks, characteristically splitting into flexible sheets used in insulation and electrical equipment

Montmorillonitic - clays that are comprised mostly of montmorillonite; one of the three types of clay soil grains (illite, kaolinite, and montmorillonite)

Morphology - refers to the geological characteristics, configuration, and evolution of rocks and landforms

Porous - admitting the passage of gas or liquid through pores or interstices

Pyrite - a brass-colored mineral occurring widely and used as an iron ore and in producing sulfur dioxide for sulfuric acid; also called *fool's gold*

Scarp - a long steep slope or cliff at the edge of a plateau or ridge; usually formed by erosion

Siliceous - containing, resembling, relating to, or consisting of silica; a white or colorless crystalline compound occurring abundantly as quartz, sand, flint, agate, and many other minerals and used to manufacture a wide variety of materials, especially glass and concrete

Surficial - of, relating to, or occurring on or near the surface of the earth

Tuffaceous - comprising rocks made of compacted volcanic ash varying in size from fine sand to coarse gravel; also called *tufa*

SECTION 00 42 00 - PROPOSAL FORM

PROJECT: LOS FRESNOS CITY HALL

CONTRACTOR: _____

The undersigned proposer does hereby declare and stipulate that this proposal is made in good faith, without collusion or connection with any other person or persons proposing for the same work, and that it is made in pursuance of and subject to all the terms and conditions of the advertisements, proposal requirements, the proposed construction contract, and the contract documents, including the plans pertaining to the work to be done, all of which have been examined by the undersigned. The undersigned hereby declares that he has visited the site, has had sufficient time to make all tests and investigations to arrive at an intelligent estimate of the cost of doing the work, and has carefully examined the plans, specifications, and contract documents relating to the work covered by his proposal, and that he agrees to do the work, and that no representations made by the city are in any sense a warranty, but are mere estimates for guidance of the contractor.

The undersigned further agrees that he will provide all necessary tools and apparatus, do all work, furnish all materials, and do everything required to carry out the work covered by this proposal, in strict accordance with the contract documents, and the requirements pertaining thereto, for the sum of sums set forth.

TIME AND PLACE OF RECEIVING PROPOSALS: Sealed proposals in conformity with the Proposal Procedures for the project will be received in the **Los Fresnos City Hall** located at **200 N Brazil St, Los Fresnos, Texas** until **2:00 PM local time on Thursday, July 12.**

PRE-PROPOSAL CONFERENCE: A non-mandatory Pre-Proposal Conference is scheduled to occur at **2:00 PM on Thursday, June 28 in the City Hall council chamber at 200 N Brazil St, Los Fresnos, Texas**.

PROJECT DESCRIPTION: New construction of a City Hall of approximately 11,000 square feet and associated sitework as shown in the contract documents.

LOCATION OF PROJECT:
Los Fresnos City Hall
520 East Ocean Blvd
Los Fresnos, Texas 78566

ADDENDA: The undersigned hereby acknowledges receipt of the following addenda to the Drawings and Specifications, all of the provisions and requirements of which addenda have been taken into consideration in the preparation of this Proposal.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

BID SECURITY: Each proposal must be accompanied by a Cashier's Check or Certified Check of the Proposer on a State or National Bank in the State of Texas, or a bid bond prepared on the standard form of bid bond, duly executed by the Proposer as principal and having as surety thereon a surety company, approved by the Owner, in the amount of 5% of the bid. Such checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of proposals and the remaining checks or bid bonds will be returned promptly after the Owner and the accepted proposer have executed the contract, or, if no award has been made within 45 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid. Certified Check, Cashier's Check, or Bid Bond shall be made payable, without condition, to the City of Los Fresnos.

PERFORMANCE AND PAYMENT BONDS: Simultaneously with his delivery of the executed contract, the Contractor shall furnish Payment and Performance Bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner. The Performance Bond shall cover 100% of the contract sum; the Payment Bond shall cover 100% of the contract sum.

TIME OF COMPLETION: The issuance of a Notice to Proceed (NTP) requires the undersigned to commence work under this contract not later than ten (10) days thereafter and to substantially complete such work within the overall time of **330 days**.

Proposer shall indicate if they accept the specified construction duration or may show below a shorter duration period:

_____ Calendar Days

LIQUIDATED DAMAGES: The time of completion is the essence of this contract. For each calendar day that any work shall remain uncompleted after the time specified in the proposal and the contract, or the increased time granted by the Owner, or as equitably increased by additional work or materials ordered after the contract is signed, the sum of **$500 per calendar day**, unless otherwise specified in the special provisions, shall be deducted from the monies due the Contractor. The sum of money thus deducted for such delay, failure or noncompletion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, per calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work. The said amounts are fixed and agreed upon by and between Owner and Contractor because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner in such event would sustain; and said amounts are agreed to be the amount of damages which the Owner would sustain and which shall be retained from the monies due, or that may become due, the Contractor under this contract; and if said monies be insufficient to cover the amount owing, then the Contractor or his surety shall pay any additional amounts due.

LUMP SUM PROPOSAL: This is a lump sum proposal. The prices in the lump sum proposal shall include all labor, equipment, materials, services, transportation, shoring, removal, de-watering, overhead, profit, insurance, bonding, etc., to cover the completed work in place.

CONTINGENCY ALLOWANCE: The contingency allowance item shall only be used at the discretion of the owner. It is intended to provide a means of payment for specific unanticipated or unforeseen work items for which no pay item is provided. Generally, these items will be minor in nature, are within the scope of the project, and comply with the intent of the plans and contract documents, however no specific

pay item exists as a means of compensation to the contractor. No portion of the contingency allowance shall be paid to the contractor nor shall any extra work be performed by the contractor without authorization from the owner. The owner shall retain all contingency allowance monies not used by the owner during the construction of the project.

BASE PROPOSAL:

Base Proposal for the Stipulated Lump Sum of		$ _____
Owner's Contingency Allowance	ADD	$ **100,000.00**
Base Proposal + Owner's Contingency Allowance		$ _____

_____

_____ Dollars

PROPOSAL ALTERNATES: Additional detailed information regarding alternates may be found in Specification Section 01 23 00 Alternates.

For your consideration, we quote the following Proposal Alternates:

A.	Alternate No. 1: Delete Landscaping & Irrigation	DEDUCT $_____
B.	Alternate No. 2: Delete Outdoor Plaza	DEDUCT $_____
C.	Alternate No. 3: Delete One Drive Thru Lane	DEDUCT $_____
D.	Alternate No. 4: Change Concrete Paving to Asphalt	DEDUCT $_____
E.	Alternate No. 5: Change Screen Fence from Composite to Cedar	DEDUCT $_____
F.	Alternate No. 6: Change 12 Unique Medallions to a Single Design	DEDUCT $_____
G.	Alternate No. 7: Change 1,360 S.F. of Manufactured Stone to Stucco	DEDUCT $_____
H.	Alternate No. 8: Change Standing Seam Metal Roof to Asphalt Shingle Roof	DEDUCT $_____
I.	Alternate No. 9: Delete Coiling Security Grilles	DEDUCT $_____
J.	Alternate No. 10: Delete Lightning Protection System	DEDUCT $_____
K.	Alternate No. 11: Change Interior Lighting from LED to Fluorescent	DEDUCT $_____
L.	Alternate No. 12: Delete Backup Generator & ATS	DEDUCT $_____

MAJOR SUBCONTRACTORS: Proposer shall list below major subcontractors whose prices are incorporated in the proposal. Generally, trades listed should be those involving major money amounts or special technical items.

Trade:	Subcontractor:
Concrete	_____
Wood Framing	_____
Mechanical	_____
Electrical	_____

CONTRACTOR'S QUALIFICATIONS STATEMENT: The undersigned shall submit with this Proposal Form a completed Contractor's Qualifications Statement.

Respectfully Submitted,

Legal Name of Proposer Firm or Corporation

Street Address

City, State Zip

Telephone

Fax

E-Mail

WITNESS:

Name of Witness (Printed or Typed)

Signature

Address

City, State Zip

Date

Affix Seal of Corporation
(if Proposer is a Corporation)

State of Incorporation

Tax ID Number

OR

Social Security Number

Name of Officer (Typed or Printed)

Signature of Officer

Title of Officer

Date

NOTE: Fill in with ink or type and submit complete with attached papers.

END OF SECTION 00 40 10

SECTION 00 43 93 - PROPOSAL SUBMISSION CHECKLIST

☐ **Sealed Envelope**: Marked "Los Fresnos City Hall Proposal / July 12, 2018" with proposer's name and address in upper left corner.

☐ **Bid Security**: Cashier's Check, Certified Check, or Bid Bond (00 60 00A) in the amount of 5% of the bid, made payable to the City of Los Fresnos.

☐ **Proposal Form** (00 42 00): With all blanks filled in.

☐ **Contractor's Qualifications Statement** (00 45 00A): One original and four copies. All blanks filled in and all requested attachments included.

☐ **Non-Collusion Affidavit** (00 45 00B)

☐ **Conflict of Interest Questionnaire** (00 45 00C)

☐ **Equal Employment Opportunity Affidavit** (00 45 00D)

☐ **Insurarance Certificates**: Demonstrating compliance with coverage amounts in 00 60 00 Bonds and Insurance

END OF SECTION 00 43 93

SECTION 00 45 00 - REPRESENTATIONS AND CERTIFICATIONS

PART 1 - GENERAL

A. The Contractor shall complete and submit the following forms which are bound into this project manual:

1. Contractor's Qualification Statement.
2. Non-Collusion Affidavit.
3. Conflict of Interest Questionnaire.
4. Equal Employment Opportunity Affidavit.

PART 2 - products

Not used.

PART 3 - execution

Not used.

END OF SECTION 00 45 00

Contractor's Qualifications Statement

1. COMPANY OVERVIEW AND FINANCIAL STABILITY

1.1 Organization

Legal Name: _____

Address: _____

Phone Number: _____

Indicate One: ___ Sole Proprietor ___ Partnership ___ Other

___ Corporation ___ Joint Venture

Name: _____ Partner: _____

Title: _____ Title: _____

Address: _____ Address: _____

City: _____ City: _____

State & Zip: _____ State & Zip: _____

Office Phone: _____ Office Phone: _____

Fax Phone: _____ Fax Phone: _____

State and Date of Incorporation, Partnership, Ownership, Etc.

_____

Number of years in business as a General Contractor: _____

Number of years in business under present business name: _____

Any other names under with firm has operated: _____

Geographical Limits of Operations: _____

1.2 Claims and Suits
(If the answer to any of the questions is yes, please attach details):

Has your organization ever failed to complete any work awarded to it? _____

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

Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years? _____

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? _____

1.3 Financial Status

Attach a copy of the current Dunn & Bradstreet report showing Proposer's financial rating.

Attach a letter from Proposer's Surety stating Proposer's ability to acquire bonding in the full amount of the contract.

Surety: _____

Address: _____

Agent and Phone: _____

Bonding Capacity per Job: _____

Maximum Aggregate Bonding Capacity: _____

Bank References (List Institution, Address, Contact Person, and Phone):

_____

_____

_____

2. EXPERIENCE AND QUALIFICATIONS OF STAFF

Attach an organizational chart showing the Proposer's key personnel positions and lines of authority.

Attach resumes with names, qualifications, and experience of Proposer's key personnel positions proposed for this project.

Total Number of Employees: _____

Total Number of Employees to be Associated with this Job: _____

Managerial _____ Administrative _____ Professional_____

Skilled _____ Semi-Skilled _____ Other _____

Percentage of Work to be done by Proposer's Employees (Based on Dollars Bid): _____

Type(s) of Work to be done by Proposer's Employees (examples: concrete paving, water lines, sanitary sewer lines, excavation, masonry, plumbing, electrical, HVAC, roofing, etc.)

_____

_____

3. EXPERIENCE WITH SIMILAR PROJECT TYPES

Attach examples of Proposer's experience in constructing other similar projects, preferably within the last five years. Include the following information:

Project Name	Owner/Agency	Architect
Location (City and State)	Contact Person	Contact Person
Project Description	Phone Number	Phone Number
Construction Cost		
Year Completed		

4. EXPERIENCE WITH LOCAL PROJECTS

Attach a list of Proposer's local and regional project experience in the following order (include Project Name, Location, and Owner/Agency):

Projects completed for the City of Los Fresnos
Projects located within the City of Los Fresnos
Projects completed for Municipalities or Governmental Entities within Cameron County
Projects located within Cameron County

5. SCHEDULE AND ABILITY TO MEET DEADLINES

Attach a summary level schedule for the project indicating the Proposer's proposed construction schedule. Base the schedule on calendar days, starting with the Owner's notice to proceed and end with final completion of the work.

Attach summary level schedules of at least three of the similar projects submitted under Section 3 comparing the Proposer's initial construction schedules with the final construction schedules. Base the schedules on calendar days, starting with the Owner's notice to proceed and end with final completion of the work. If the comparison reveals a disparity between the initial and final construction schedules, explain why.

6. SAFETY PROGRAM AND RECORD

Liability Insurance Provider: _____

Public Liability Limits of Coverage ($2,000,000 minimum): _____

Property Damage Limits of Coverage ($1,000,000 minimum): _____

Vehicle Liability Limits of Coverage ($1,000,000 minimum): _____

Workers Compensation Insurance Provider: _____

Workers Compensation, Texas Statutory, Benefits
Employer's Liability Limits of Coverage ($1,000,000 minimum):_____

Proposer's Experience Modifier Rate (EMR): _____

Proposer's Recordable Incident Rate (RIR): _____

Attach a summary of the Proposer's safety program execution plan (1 page maximum).

7. QUALITY ASSURANCE PROGRAM

Attach a summary of the Proposer's quality assurance plan (1 page maximum).

8. CURRENT WORKLOAD AND AVAILABILITY

Attach a list of the Proposer's current workload and state the Proposer's availability to start construction on the project.

NON-COLLUSION AFFIDAVIT

STATE OF TEXAS §
§
COUNTY OF CAMERON §

By the signature below, the signatory for the bidder certifies that neither he nor the firm, corporation, partnership or institution represented by the signatory or anyone acting for the firm bidding this project has violated the antitrust laws of this State, codified at Section 15.01, *et seq.*, Texas Business and Commerce Code, or the Federal antitrust laws, nor communicated directly or indirectly the bid made to any competitor or any other person engaged in the same line of business, nor has the signatory or anyone acting for the firm, corporation or institution submitting a bid committed any other act of collusion related to the development and submission of this bid proposal.

Signature: _____

Printed Name: _____

Title: _____

Company: _____

Date: _____

SUBSCRIBED and sworn to before me the undersigned authority by _____ the _____ of, _____on behalf of said bidder.

_____
Notary Public in and for the
State of Texas

My commission expires: _____

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____

Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

EQUAL OPPORTUNITY EMPLOYER AFFIDAVIT

STATE OF TEXAS §
§
COUNTY OF CAMERON §

This company, contractor or subcontractor agrees to refrain from discrimination in terms and conditions of employment on the basis of race, color, religion, sex or national origin, and agrees to take affirmative action as required by Federal Statutes and Rules and Regulations issued pursuant thereto in order to maintain and insure nondiscriminatory employment practices.

Signature: _____

Printed Name: _____

Title: _____

Company: _____

Date: _____

SUBSCRIBED and sworn to before me the undersigned authority by _____ the _____ of, _____on behalf of said bidder.

_____
Notary Public in and for the
State of Texas

My commission expires: _____

SECTION 00 05 00 - GENERAL FORM OF AGREEMENT

PART 1 - GENERAL

A. AIA Document A101, 2007 edition, Agreement Between Owner and Contractor when the basis of payment is a stipulated sum, shall be the agreement for this work. A sample copy of the contract is bound into the project manual. By submitting a proposal each proposer agrees to use the contract form modified, as necessary, to incorporate the terms of this Request for Proposals and the proposer's proposal as the same may be modified by the Owner and proposer as part of the selection process.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 00 05 00

DRAFT

AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«2007 Templates»
« »
« »

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

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.

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

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

10 INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

« »

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

« »

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than « » (« ») days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

« »

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

Portion of Work	Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

« »

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 4.3 Unit prices, if any:
(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit ($0.00)

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of « » percent (« » %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of « » percent (« » %);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

« »

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2007

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

§ 8.3 The Owner's representative:
(Name, address and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 The Contractor's representative:
(Name, address and other information)

« »
« »
« »
« »

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

« »
« »

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

« »

Section	Title	Date	Pages

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

« »

Number	Title	Date

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

« »

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

« »

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount ($0.00)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	CONTRACTOR *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 12:16:09 on 03/27/2012 under Order No.7513687004_1 which expires on 10/06/2012, and is not for resale.
User Notes: (1279355183)

SECTION 00 60 00 - BONDS AND INSURANCE

PART 1 - GENERAL

A. Bonds
   1. Bid Security: Each proposal must be accompanied by a Cashier's Check or Certified Check of the Proposer on a State or National Bank in the State of Texas, or a bid bond prepared on the standard form of bid bond, in the amount of 5% of the bid. Certified Check, Cashier's Check, or Bid Bond shall be made payable, without condition, to the City of Los Fresnos. Sample copy of Bid Bond is bound into the project manual.
   2. Performance Bond and Payment Bond shall be required. Each bond shall be furnished in amount equal to 100 percent of the total contract amount. Sample copies of Performance Bond and Payment Bond are bound into the project manual.

B. Insurance: The contractor shall certify in writing that the Contractor provides workers compensation insurance for each employee to the General Contractor. In addition the contractor must maintain the following coverage and shall remain in effect until the end of the contract. Each proposal must be accompanied by certificates of insurance demonstrating compliance with the required coverage amounts below:
   1. Public Liability Insurance: $2,000,000
   2. Property Damage Insurance: $1,000,000
   3. Vehicle Liability Insurance: $1,000,000
   4. Workers Compensation, Texas Statutory, Benefits Employer’s Liability: $1,000,000

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 00 60 00

BID BOND

STATE OF TEXAS '

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF _____ '

That we, _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the City of Los Fresnos in the penal sum of: _____ Dollars $_____ OR 5% of the bid, for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal has submitted a bid to the City of Los Fresnos for the project named:

_____

_____

Now, Therefore, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be hull and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this _____ day of _____, _____, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____, Principal (PRINCIPAL'S SEAL if a corporation)

By: _____
Title: _____

_____, Surety (SURETY'S SEAL)

By: _____
Attorney-in-Fact

PERFORMANCE BOND

STATE OF TEXAS '

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF _____ '

That we, _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the City of Los Fresnos in the penal sum of: _____ Dollars $_____ for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract, hereto attached and made a part hereof, with the City of Los Fresnos, dated _____ for the _____ _____ _____

Now, if the Principal shall faithfully perform the contract in accordance with the plans, specifications and contract documents, and shall fully indemnify and save harmless the City of Los Fresnos from all costs of damage which the City of Los Fresnos may suffer by reason of the Principal's default or failure to perform and shall fully reimburse and repay the City of Los Fresnos all outlay and expense which the City of Los Fresnos may incur in making good any such default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

In the event Principal is in default under the contract as defined herein, Surety will within fifteen (15) days of determination of such default take over and assume completion of such contract and become entitled to the payment of the balance of the contract price, or the Surety shall make other arrangements satisfactory with the obligee for the completion of the defaulted work but in no event shall the Surety's liability exceed the penalty of this bond.

The 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 the work to be performed thereunder or the specifications accompanying the same shall in any wise 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.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this _____ day of _____, _____, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____, Principal (PRINCIPAL'S SEAL if a corporation)

By: _____
Title: _____

_____, Surety (SURETY'S SEAL)

By: _____
Attorney-in-Fact

PAYMENT BOND

STATE OF TEXAS '

KNOW ALL MEN BY THESE PRESENTS:

COUNTY OF _____ '

That we, _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the City of Los Fresnos in the penal sum of: _____ Dollars $_____ for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract, hereto attached and made a part hereof, with the City of Los Fresnos, dated _____ for the _____ _____ _____

Now, if the Principal shall promptly make payments to all claimants as defined in Texas Government Code, Chapter 2253, supplying labor and materials in the prosecution of the work provided for in said contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

This bond is made and entered into solely for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said contract, and all such claimants shall have a direct right of action under the bond as provided in Texas Government Code, Chapter 2253.

The 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 the work to be performed thereunder or the specifications accompanying the same shall in any wise 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.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this _____ day of _____, _____, the name and corporate seal of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

_____, Principal (PRINCIPAL'S SEAL if a corporation)

By: _____
Title: _____

_____, Surety (SURETY'S SEAL)

By: _____
Attorney-in-Fact

SECTION 00 70 00 - GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

A. The General Conditions of the Contract for Construction, AIA Document A201, 2007 edition, hereinafter referred to as the "General Conditions" is hereby made a part of this Specification, to the same extent as if reproduced in full except as modified, revised,or rescinded by the Supplementary Conditions. Copies of the General Conditions may be obtained from the American Institute of Architects, or may be examined at the office of the Architect.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 00 70 00

DRAFT

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
«~~_2007 Templates~~»
« »

THE OWNER:
(Name, legal status and address)
« »« »
« »

THE ARCHITECT:
(Name, legal status and address)
«~~_Brown Reynolds Watford Architects, Inc.~~»« »
«~~_3535 Travis Street, Suite 250~~
~~Dallas, Texas 75204~~»

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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.

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

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

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

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7, 14.1, 15.2
Addenda
1.1.1, 3.11.1
Additional Costs, Claims for
3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.5**
Additional Insured
11.1.4
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8, 7.3.8
All-risk Insurance
11.3.1, 11.3.1.1
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3
Approvals
2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1
Arbitration
8.3.1, 11.3.10, 13.1.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2
Architect's Additional Services and Expenses
2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.4.1, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1, 5.2.1, 11.4.1
Binding Dispute Resolution
9.7, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1
Boiler and Machinery Insurance
11.3.2
Bonds, Lien
7.3.7.4, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**
Building Permit
3.7.1
Capitalization
1.3

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3
Certificates of Inspection, Testing or Approval
13.5.4
Certificates of Insurance
9.10.2, 11.1.3
Change Orders
1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.1, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 7.4.1, 8.3.1, 9.3.1.1, 11.3.9
Claims, Definition of
15.1.1
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, **15.1.4**
Claims for Additional Time
3.2.4, 3.7.46.1.1, 8.3.2, 10.3.2, **15.1.5**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Claims Subject to Arbitration
15.3.1, 15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4
Commencement of the Work, Definition of
8.1.2
Communications Facilitating Contract Administration
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7
Compliance with Laws
1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.3
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 11.3.9, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.2.5, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, **9.1**, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5
Contract Sum, Definition of
9.1
Contract Time
3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Contractor's Construction Schedules
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contractor's Employees
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1,
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8
Contractor's Relationship with the Architect
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
9.7
Contractor's Right to Terminate the Contract
14.1, 15.1.6
Contractor's Submittals
3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3
Contractual Liability Insurance
11.1.1.8, 11.2
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.2.5, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.7
Costs
2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Damages for Delay
6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1
Delays and Extensions of Time
3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2, 11.1.2
Emergencies
10.4, 14.1.1.2, 15.1.4
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1
Equipment, Labor, Materials or
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3, 15.1.5, 15.2.5
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3.1, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
Fire and Extended Coverage Insurance
11.3.1.1
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7
Information and Services Required of the Owner
2.1.2, **2.2**, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4.1
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2
Instruments of Service, Definition of
1.1.7
Insurance
3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, **11**
Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, **11.3**
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12, 15.1.4
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2, 13.6.1, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 13.7, 15.4.1.1
Limitations of Liability
2.3.1, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2
Limitations of Time
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3
Material Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 15.2.8
Mediation
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1
Minor Changes in the Work
1.1.1, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2, 11.3.1
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Notice
2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7, 9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1
Notice, Written
2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14, 15.2.8, 15.4.1
Notice of Claims
3.7.4, 10.2.8, **15.1.2**, 15.4
Notice of Testing and Inspections
13.5.1, 13.5.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.2.2, 9.6.6, 9.8, 11.3.1.5
Orders, Written
1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Information and Services Required of the
2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Owner's Authority
1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3.1, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Financial Capability
2.2.1, 13.2.2, 14.1.1.4
Owner's Liability Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.4, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.3
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17, 4.2.12, 5.3.1
Partial Occupancy or Use
9.6.6, **9.9**, 11.3.1.5
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3.1, 13.7, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.7.4, 9.6.7, 9.10.3, **11.4**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.7.4, 9.6.7, 9.10.3, **11.4**
Permits, Fees, Notices and Compliance with Laws
2.2.2, **3.7**, 3.13, 7.3.7.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.3
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.3**
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4
Rejection of Work
3.5, 4.2.6, 12.2.1
Releases and Waivers of Liens
9.10.2
Representations
3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, **13.4**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3.1, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5
Special Inspections and Testing
4.2.6, 12.2.1, 13.5
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14
Statute of Limitations
13.7, 15.4.1.1
Stopping the Work
2.3, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3.7**
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 13.7
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Substitution of Architect
4.1.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3
Surety
5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7
Surety, Consent of
9.10.2, 9.10.3
Surveys
2.2.3
Suspension by the Owner for Convenience
14.3
Suspension of the Work
5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.7.4
Termination by the Contractor
14.1, 15.1.6
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.6
Termination by the Owner for Convenience
14.4
Termination of the Architect
4.1.3
Termination of the Contractor
14.2.2
TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, **13.5**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5
Time Limits
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4
Time Limits on Claims
3.7.4, 10.2.8, **13.7**, 15.1.2
Title to Work
9.3.2, 9.3.3
Transmission of Data in Digital Form
1.6
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 7.3.4
Use of Documents
1.1.1, 1.5, 2.2.5, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.4.2
Waiver of Claims by the Contractor
9.10.5, 13.4.2, 15.1.6
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6
Waiver of Consequential Damages
14.2.4, 15.1.6
Waiver of Liens
9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3.7**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7
Weather Delays
15.1.5.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Notice
2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, **13.3**, 14, 15.4.1
Written Orders
1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

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 bid, Instructions to Bidders, 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 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 and certify termination of the Agreement under Section 14.2.2.

§ 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 2.2.2 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.

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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.

§ 2.3 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.

§ 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 2.2.3, 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 make 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 authorized by the Architect in accordance with Sections 3.12.8 or 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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

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.

§ 3.6 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 21 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 an equitable adjustment 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 in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed 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,

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

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 furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply 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 SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be 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, 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 maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 the way by which 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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly 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

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 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, and 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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 such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or 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 Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such 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

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

other rights or obligations of indemnity which 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 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.

§ 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.

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

§ 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, except as provided in Section 3.3.1.

§ 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) 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 FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 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

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such 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, material and equipment 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, unless otherwise specifically stated by the Architect, 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 authorize 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 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 subcontractors of a separate contractor.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply 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 previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these 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 in writing; 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 such 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 Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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 report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report 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, except as to defects not then reasonably discoverable.

§ 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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, and the Contractor shall proceed promptly, 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 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 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.

§ 7.3.6 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.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 related to the Work; and

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

§ 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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material 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 material 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

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

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, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part 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 comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. 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. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. 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 material 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 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 the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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 Architect will reflect such payment on the next Certificate 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 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' written 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 shut-down, 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 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 written 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 and, 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 terms and conditions of 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 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 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; or
.3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material 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 or the Contractor's Subcontractors or Sub-subcontractors; 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 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 owners and users of adjacent sites and utilities.

§ 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, except damage or loss 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written 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 such material or substance or who are to perform the task of removal or safe containment of such 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 in the amount of the Contractor's reasonable additional costs of shut-down, 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 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify the Contractor for all cost and expense thereby incurred.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 an 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 written 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 2.4.

§ 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, whether completed or partially completed, of the Owner or separate contractors 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

§ 13.4.2 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 there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 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 (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 13.5.5 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.

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

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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 promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written 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 as described in 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 written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written 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 must 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 CONTINUING CONTRACT PERFORMANCE

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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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.

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

§ 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 such 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 15.1.6 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 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. 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

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

DRAFT

AIA Document A201™ – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. **All rights reserved.** **WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at 13:59:15 on 07/08/2010 under Order No.9382348541_1 which expires on 10/06/2010, and is not for resale.
User Notes: (1918133608)

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Contractor's Duties.
   4. Procedures for requesting additional time due to Weather Delays.
   5. Work by Owner.
   6. Owner-furnished products.
   7. Access to site.
   8. Coordination with occupants.
   9. Work restrictions.
   10. Specification and drawing conventions.

B. Related Requirements:
   1. Division 01 Section - Temporary Facilities and Controls for limitations and procedures governing temporary use of Owner's facilities.

1.03 PROJECT INFORMATION

A. Project Identification: Los Fresnos City Hall. BRW Project No. 217072.00
   1. Project Location: 520 East Ocean Blvd, Los Fresnos, TX 78566.

B. Owner: City of Los Fresnos.
   1. Owner's Representative: Mark Milum, City Manager, Telephone: (956) 233-5768 Email: mmilum@citylf.us

C. Architect: Brown Reynolds Watford Architects, Inc., 2700 Earl Rudder Freeway South, Suite 4000, College Station, Texas 77845 Telephone: (979) 694-1791 Fax: (979) 842-8293

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
   1. Civil / Structural Engineer: Gessner Engineering, 2501 Ashford Drive, Suite 102, College Station, Texas 77840.
   2. MEP Engineering: Jordan & Skala Engineering, 2929 Briar Park, Suite 510, Houston, Texas 77042.

1.04 CONTRACTOR'S DUTIES

A. Furnish & provide for proper execution and completion of work as required by the Contract Documents all:
   1. Labor, materials and equipment.
   2. Tools, construction equipment and machinery.
   3. Water, heat and utilities required for construction.
   4. Other facilities and services necessary for proper execution and completion of the work.

B. Attain and pay for all required permits, licenses, and government fees. **The City of Los Fresnos will waive the Building Permit fee and City inspection fees**.

1. Unless specifically indicated otherwise, Contractor is responsible to hire and pay for all third party reviews and inspections required by authorities having jurisdiction.
    a. Architect will retain and Owner will pay for handicap accessibility inspection required by TDLR. Coordinate scheduling with Architect to coincide with or to follow after substantial completion.

C. Give required notices.

D. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

E. Promptly submit written notice to Architect of observed variance of Contract Documents from legal requirements. It is not Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.

F. Contractor shall verify all conditions at the site and dimensions in the field prior to starting work. Architect shall be notified in writing of any discrepancies found.

G. The Drawing and Specifications represent the work to be completed not the method of construction. However, the Contractor shall perform all demolition and remedial work in a sequence to where any interruption of the operation of the facilities or utility service occurs at an absolute minimum.

H. Contractor shall use every precaution to prevent damage to roads, landscape, adjacent property, building and utilities above and below ground that are adjacent to or included in the area under contract. The Contractor shall repair and replace, at his expense, any material or building affected, damaged or destroyed because of his operations or work.

I. Safety Requirements: The CONTRACTOR has full responsibility for the safety of workers and for all damages to personal property caused by its operations. The CONTRACTOR is responsible for following all Federal, State, and Local Regulations and Guidelines with regards to worker and public safety. Unless otherwise indicated on the proposal, the necessary tools, equipment, procedures, etc. for following the appropriate regulations and guidelines will be considered subsidiary to other proposal items.

1.05 WEATHER DAYS

A. The Contractor may be granted an extension of time because of abnormal inclement weather conditions. Contractor shall submit reports on monthly intervals indicating the rainfall and temperature on inclement weather days to document for each month the days in excess of normal inclement weather conditions that may contribute to future time extension requests.
    1. Provide reports each month whether or not Contractor believes at that time that time extension will be necessary. In months not exceeding normal inclement weather days and for which additional time will not be requested, reports need not be provided.
    2. Available float shall be used before any request is made for time extension due to inclement weather.

B. For the purpose of this contract, "abnormal inclement weather" will be interpreted as those days in excess of the number of days shown in columns B and D in the below PRECIPITATION / TEMPERATURE chart for exterior critical path activities. Drying days shall also be interpreted as "abnormal inclement weather" days.

C. Weather Conditions: The information in the following tables was compiled from the records of the National Weather Service for the Los Fresnos area (See web site: http://w2.weather.gov/climate/xmacis.php?wfo=bro).

PRECIPITATION / TEMPERATURE

COLUMN	A	B	C	D
Month	Normal (Inches)	Average Days w/ 0.1" or More Rain	Normal Temperature (Degrees F.)	Average Days 32 Degrees F. or Below
Jan.	1.27	2	61.1	0
Feb.	1.08	2	64.2	0
Mar.	1.23	2	69.3	0
Apr.	1.54	2	74.8	0
May	2.64	2	80.3	0
Jun.	2.57	3	83.9	0
Jul.	2.04	3	84.9	0
Aug.	2.44	4	85.3	0
Sep.	5.92	8	81.8	0
Oct.	3.74	5	76.3	0
Nov.	1.82	3	69.4	0
Dec.	1.15	3	62.2	0

D. All claims for additional time shall be limited to time extensions only. Claims for additional costs due to time extensions shall not be considered.

1.06 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Work of the project is for all labor, supervision, materials, services and equipment required in conjunction with all work to construct a new one-story City Hall of approximately 11,000 square feet. The occupancy classification is mixed occupancy with Assembly (A-3) and Business (B). The type of construction is Type V-B. Administrative areas include vestibule, lobby, reception, offices, cashier, court clerks, breakroom, conference room, jury deliberation, records retention, file storage, and general storage. Assembly spaces include the court room, council chambers, and a/v room. There will also be a drive-thru area for city patrons to send in various payments. The exterior will be manufactured stone veneer and stucco over wood sheathing. The foundation will be a stiffened slab on grade. The structural system will be wood stud framing with pre-engineered wood floor and roof trusses. Site work includes clearing, grading, utilities to building, concrete paving, landscaping, concrete plaza, and irrigation.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.07 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Telecommunications wiring and equipment installation, including voice, data, and cable TV.
   2. Audio Visual wiring and equipment installation.
   3. Security System and Security Camera System wiring and equipment installation.

C. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
   1. Furniture, fixturing and equipment installation.

1.08 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:
   1. Break Room appliances, including: Microwave, Refrigerator with Ice Maker, and Dishwasher.

1.09 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.10 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
   3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
   4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
   2. Comply with work hour and noise restriction requirements of local authorities, if such exist.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 10 00

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.01 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.

1.02 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. Contingency allowances.

C. Related Requirements:
   1. Divisions 02 through 48 Sections for items of Work covered by allowances.

1.03 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.04 INFORMATIONAL SUBMITTALS

A. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.05 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.06 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders or Contingency Expenditures that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.

C. Change Orders or Contingency Expenditures authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 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.

3.03 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of $100,000.00 for use according to Owner's written instructions.

END OF SECTION 01 21 00

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.03 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
   3. Alternate Bids shall include all overhead and profit applicable to that portion of the work.
   4. The description below for each Alternate Bid is recognized to be incomplete and abbreviated, but implies that each change must be complete for the scope of work affected. The descriptions are primarily scope definitions, and do not necessarily detail the full range of materials and processes needed to complete the work as required. Refer to applicable Specification Sections, and to applicable drawings, for the specific requirements of the work, regardless of whether references are so noted in the description of each Alternate. Coordinate related work and modify surrounding work as required to properly integrate with the work of each Alternate. Any change of details, construction, etc., as required to accommodate the Alternate shall be the responsibility of the Contractor and shall be included in his Alternate Bid Price.
   5. Where methods of construction, materials, finishes, or details of installation, required by the various Alternate Bids, differ from the requirements shown on drawings or specified for corresponding items, the Alternate construction, materials, etc., will be subject to approval by the Architect.
   6. Approval of the Alternate makes all requirements of scope, performance, submissions, service and guarantee binding as any other material name appearing in the Specifications for the Base Bid. All necessary changes in building design or construction to accommodate the alternate materials shall be the sole responsibility of the Contractor without extra cost to the Owner.

1.04 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
   2. Prior to installation of the Alternate items, verify that all surfaces have been modified as necessary to accept the installation and that the item or items may be installed in

complete accordance with their manufacturer's current recommendations. Notify the Architect of any discrepancies before proceeding.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. Deduct Alternate No. 1: Delete Landscaping & Irrigation
   1. Remove landscaping and irrigation from the scope of the project. See Sheets L1.1, L1.2, and L1.3. The PVC sleeves shown on L1.2 are not part of this Alternate. If accepted, sleeves shall remain in order to permit future installation of an irrigation system.

B. Deduct Alternate No. 2: Delete Outdoor Plaza
   1. Includes concrete planters, step lighting, concrete sidewalk, and concrete unit pavers. See Sheet C1.3. If accepted, the circular area left by deleting the plaza shall be filled with grass sod and slightly mounded in the center.

C. Deduct Alternate No. 3: Delete One Drive Thru Lane
   1. Reduce paving per Sheet C1.3. Reduce building materials including masonry-clad columns and footings, wood and steel framing, stucco, roofing, and coping cap. Delete one pneumatic tube system.

D. Deduct Alternate No. 4: Change Concrete Paving to Asphalt.
   1. See Alternate Site Plan and Curb Detail on Sheet C1.3. See Specification Section 32 12 16 Bituminous Concrete Pavement.

E. Deduct Alternate No. 5: Change Screen Fence from Composite to Cedar.
   1. See Alternate Fence Detail on Sheet C1.3. See Specification Section 32 31 29 Wood and Composite Fencing. Gates remain in the scope of the project, regardless of fence material.

F. Deduct Alternate No. 6: Change 12 Unique Medallions to a Single Design.
   1. See Detail 6, Sheet A2.2.

G. Deduct Alternate No. 7: Change 1,360 S.F. of Manufactured Stone to Stucco.
   1. See Sheets A2.1 and A2.2. On the sides and back of the building, the manufactured stone wainscot is changed to stucco. Color to be selected by Architect.

H. Deduct Alternate No. 8: Change Standing Seam Metal Roof to Asphalt Shingle Roof.
   1. See Specification Section 07 31 13 Shingle Roofing & Flashing.

I. Deduct Alternate No. 9: Delete Coiling Security Grilles.
   1. Coiling Security Grilles are removed from the scope of the project. Gypsum board furrdowns in ceilings shall remain. Coordinate with Owner as to whether provisions need to be made for future installation of counter doors.

J. Deduct Alternate No. 10: Delete Lightning Protection System.

1. Lightning Protection System is removed from the scope of the project.

K. Deduct Alternate No. 11: Change Interior Lighting from LED to Fluorescent.
   1. See Light Fixture Schedule on Sheet E0.1 for both base bid and alternate fixtures.

L. Deduct Alternate No. 12: Delete Backup Generator & ATS.
   1. Backup Generator and ATS are removed from the scope of the project. If accepted, all conductors and conduit serving those devices shall remain. Owner will purchase Generator and ATS separately, to be installed by Contractor.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Division 01 Section - Allowances for products selected under an allowance.
   2. Division 01 Section - Alternates for products selected under an alternate.
   3. Division 01 Section - Product Requirements for requirements for submitting comparable product submittals for products by listed manufacturers.
   4. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.03 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.

1.04 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 form acceptable to Architect.
   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.
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 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.

1.05 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.

1.06 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.01 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 30 days after the Notice of Award. 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 01 25 00

Advancement of Construction Technology

SUBSTITUTION REQUEST

(After the Bidding Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

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

Copyright 1996, Construction Specification Institute,
601 Madison Street, Alexandria, VA 22314-1791

September 1996
CSI Form 13.1A

SUBSTITUTION REQUEST
(Continued)

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.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- 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.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

_____

_____

_____

Copyright 1996, Construction Specification Institute,
601 Madison Street, Alexandria, VA 22314-1791

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Division 01 Section - Substitution Procedures for administrative procedures for handling requests for substitutions made after the Contract award.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 (or similar), "Architect's Supplemental Instructions."

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use AIA Document G709 (or similar) for Proposal Requests.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use AIA Document G709 (or similar) for Proposal Requests.

1.05 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.06 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.07 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Division 01 Section - Allowances for procedural requirements governing the handling and processing of allowances.
   2. Division 01 Section - Contract Modification Procedures for administrative procedures for handling changes to the Contract.
   3. Division 01 Section - Construction Progress Documentation for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 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.

1.04 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.

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. 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.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. 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.
6. 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.
7. 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.
8. 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.
9. 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.

1.05 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: Submit Application for Payment to Architect by the 1st day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
    1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment, or similar forms acceptable to Architect and Owner Submit forms for approval with initial submittal of schedule of values.

D. 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.

E. 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.

F. 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.
2. If approved by Owner, submit electronic transmission of Pay Application, in lieu of paper copies.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
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. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. 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. Products list (preliminary if not final).
5. Submittal schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.

I. 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.

J. 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. Evidence that claims have been settled.
   7. 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.
   8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Conservation.
   3. Correlation of Documents.
   4. Coordination drawings.
   5. Requests for Information (RFIs).
   6. Project Web site.
   7. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Division 01 Section - Construction Progress Documentation for preparing and submitting Contractor's construction schedule.
   2. Division 01 Section - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 01 Section - Closeout Procedures for coordinating closeout of the Contract.

1.03 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 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 and in temporary field office. Keep list current at all times.

1.05 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.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities **[and activities of other contractors]** 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.

1.06 CORRELATION OF DOCUMENTS

A. Any discrepancy in the documents shall be interpreted to include the most restrictive or costly solution. In case of discrepancy either in figures or Drawings or Specifications, the matter must be promptly submitted by the Contractor to the Architect, who will promptly make a determination in writing. Any adjustment by the Contractor without such a determination by the Architect will be at the Contractor's own risk and expense. The Architect will furnish, as necessary, additional detailed Drawings and information for clarification.

B. If a document discrepancy is identified prior to bidding, the Architect is to be notified so a written clarification may be issued.

C. Any survey drawing documents included herein are for convenience of the Contractor and Owner. The Architect assumes no responsibility as to their completeness or accuracy.

D. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, is of like effect as if shown or mentioned in both.

E. On any of the Drawings in which a portion of the work is detailed or drawn out and the remainder is shown in outline, the parts detailed or drawn out will apply also to all other like portions of the work.

F. When the word "similar" appears on Drawings, it has a general meaning and must not be interpreted as meaning identical. All details must be worked out in relation to their location and connection with other parts of the work.

G. Refer to Architectural Drawings for verification of locations, sizes and dimensions.

1.07 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. Refer to Division 23 Section - Basic Mechanical Materials and Methods and Division 26 Section - Basic Electrical Materials and Methods for specific Coordination Drawing requirements for mechanical and electrical installations.
7. Mechanical and Plumbing Work: Work to be shown shall include, but not be limited to 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.
8. Electrical Work: Work to be shown shall include, but not be limited to 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.
9. Fire-Protection System: Work to be shown shall include, but not be limited to the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
10. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
11. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section - Submittal Procedures.
12. Staff Names: Submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site with the bid proposal. Within 15 days of starting construction operations, identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
13. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone

1.08 REQUESTS FOR INFORMATION (RFI'S)

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.
    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. RFI Forms: AIA Document G716, Form bound in Project Manual, or Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect 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 according to Division 01 Section - Contract Modification Procedures.
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
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 response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect 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.

1.09 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Critical work sequencing and long-lead items.
      c. Designation of key personnel and their duties.
      d. Lines of communications.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. Preparation of record documents.
      l. Work restrictions.
      m. Working hours.
      n. Owner's occupancy requirements.
      o. Responsibility for temporary facilities and controls.
      p. Procedures for moisture and mold control.
      q. Procedures for disruptions and shutdowns.
      r. Construction waste management and recycling.
      s. Parking availability.
      t. Office, work, and storage areas.
      u. Equipment deliveries and priorities.
      v. First aid.
      w. Security.
      x. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility requirements.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written instructions.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.

f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to 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 current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Safety
14) Work hours
15) Status of RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Submittals schedule
   4. Construction schedule updating reports.
   5. Daily construction reports.
   6. Material location reports.
   7. Site condition reports.
   8. Special reports.
   9. Construction photographs.

B. Related Requirements:
   1. Division 01 Section - Payment Procedures for submitting the Schedule of Values.
   2. Division 01 Section - Project Management and Coordination for submitting and distributing meeting and conference minutes.
   3. Division 01 Section - Submittal Procedures for submitting schedules and reports.
   4. Division 01 Section - Quality Requirements for submitting a schedule of tests and inspections.
   5. Division 01 Section - Closeout Procedures for submitting photographic negatives as Project Record Documents at Project closeout.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

1.04 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file.

B. Startup construction schedule.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Photographs: Submit electronic copies of each photographic view with Application for Payment.
   1. Format: jpeg electronic file.

2. Submit a complete set of photographs on CD or USB Drive as a Project Record Document. Identify date photographs were taken.

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.

F. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

G. Daily Construction Reports: Submit at monthly intervals.

H. Material Location Reports: Submit at monthly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Special Reports: Submit at time of unusual event.

1.05 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
      a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for Notice of Award to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
   3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
   4. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Uninterruptible services.
      c. Use of premises restrictions.
      d. Seasonal variations.
      e. Environmental control.
   5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Mockups.
      e. Fabrication.
      f. Sample testing.
      g. Deliveries.
      h. Installation.
      i. Tests and inspections.
      j. Adjusting.
      k. Curing.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
   b. Temporary enclosure and space conditioning.
   c. Permanent space enclosure.
   d. Completion of mechanical installation.
   e. Completion of electrical installation.
   f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion**.**

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (see special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.

13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Format: digital, jpeg.

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Photographs: Before starting construction, take twelve color photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

D. Periodic Construction Photographs: Take twelve color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take twelve color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Periodic construction photographs.
   2. Final completion construction photographs.
   3. Web-based construction photographic documentation.

B. Related Requirements:
   1. Division 01 Section - Submittal Procedures for submitting photographic documentation.
   2. Division 01 Section - Closeout Procedures for submitting photographic documentation as project record documents at Project closeout.

1.03 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph.

1.04 QUALITY ASSURANCE

A. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.05 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

2.02 WEB-BASED PHOTOGRAPHIC DOCUMENTATION

A. Project Camera: Provide fixed exterior camera installation, mounted to provide unobstructed view of construction site from locations approved by Architect.
   1. Provide two (2) fixed-location cameras, with the following characteristics:
      a. Static view
      b. Capable of producing minimum 3.0 megapixel pictures.
      c. Provide power supply, active high-speed data connection to service provider's network, and static public IP address for each camera.

B. Web-Based Image Access: Password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.

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.

B. 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 file name for each image.
   2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

D. Periodic Construction Photographs: Take 24 photographs weekly, 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.

E. Final Completion Construction Photographs: Take 24 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

3.02 WEB-BASED CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

A. Live Streaming Construction Site Images: Provide Web-accessible image of current site image from fixed location camera(s), updated at 15 minute intervals during daytime operation.

B. Time-Lapse Sequence Construction Site Recordings: Provide video recording from a fixed-location camera to show status of construction and progress.
   1. Frequency: Record one frame of video recording every 15 minutes, from same vantage point each time, to create a time-lapse sequence of construction activities.
   2. Timer: Provide timer to automatically start and stop video recorder so recording occurs only during daylight construction work hours.

C. Maintain cameras and Web-based access in good working order according to Web-based construction photographic documentation service provider's written instructions until final completion. Provide for service of cameras and related networking devices and software.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
   1. Division 01 Section - Payment Procedures for submitting Applications for Payment and the schedule of values.
   2. Division 01 Section - Project Management and Coordination for submitting Coordination Drawings.
   3. Division 01 Section - Construction Progress Documentation for submitting schedules and reports, including Contractor's construction schedule.
   4. Division 01 Section - Operation and Maintenance Data for submitting operation and maintenance manuals.
   5. Division 01 Section - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.
   6. Division 01 Section - Closeout Procedures for submitting warranties Project Record Documents and operation and maintenance manuals.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.04 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
    1. Architect may furnish Contractor specifically requested digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
        a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
        b. Digital Drawing Software Program: The Contract Drawings are available in AutoCad format.
        c. Contractor shall execute a data licensing agreement in the form of an Agreement acceptable to Architect, as a prerequisite for Architect providing electronic files. Architect's consultants may require additional agreements as condition for release of their electronic files.
            1) Contractor shall bind all parties receiving or using these files to the same agreements.
        d. The following digital data files may be furnished for each appropriate discipline:
            1) Site plan.
            2) Architectural floor plans.
            3) Drawings specifically requested by Contractor and agreed to be provided by the Architect and Architect's consultants.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
    1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
    3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
    4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
   5. Concurrent Review of Submittals: Where two or more submittals require concurrent review, Architect retains the right to hold submittals until all submittals required for concurrent review are received. Architect will notify Contractor of necessity for concurrent submittals after a submittal is received in absence of other related submittals required for concurrent review. The date of receipt of the last submittal required for concurrent review will be considered the date for the start of Architect's review time.
      a. Examples of submittals for concurrent review include, but are not limited to: Roofing and related flashing, accessories, and waterproofing installed by roofer; doors, door frames, and hardware submittals; and window or glazing systems and glass.

D. Transmittals for Electronic Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review or discard any submittals received from sources other than the Contractor. Package each submittal individually. Do not group different specification sections together in one submittal. Provide transmittal form including the following information:
   1. Submittal number unique identifier, including revision identifier, and with identification of submittal contents as follows:
      a. Submittal number shall use Specification Section number followed by a dash and then a sequential number (e.g., 061000-01). Resubmittals shall include another dash followed by the letter ‘R’ and a sequential number (e.g., 061000-01-R1), or next sequential number.
      b. Name of Specification Section, with brief description of submittal contents for sections requiring multiple submittals.
   2. Overall sequence number each submittal starting with number 1 for the first submittal transmitted to the Architect, 2 for the second and so forth, indicating the chronological submission of each submittal.
   3. Provide means for insertion to permanently record Contractor's review and approval markings. Indicate Contractor's completed review prior to submitting to Architect.
   4. Include the following information for processing and recording:
      a. Project name.
      b. Date of submission to Architect.
      c. Name of Architect.
      d. Name of Contractor.
      e. Additionally, indicate names of the following, as applicable, including indication of the entity that prepared each submittal:
         1) Name of subcontractor.

2) Name of supplier / vendor.
3) Name of manufacturer.

f. Drawing number and detail references, as appropriate.
g. Location(s) where product is to be installed, as appropriate.
h. Remarks and other necessary identification.
i. Signature of transmitter.

E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Number of Copies: Provide paper submittals with a minimum of 2 copies for submittals for Architect's review, with an additional copy for each of Architect's consultants that will also review each submittal. Architect, and each of Architect's consultants involved in review, will retain one copy each for their records, and return additional copies with annotations.
a. Submit additional copies if Contractor requires more than one paper copy returned for Contractor's use. When shop drawings are required to be annotated by Contractor for as-built conditions and submitted as record drawings, include a copy dedicated for this purpose.
b. Submit additional copies as required by each other concurrent reviewer, as applicable, in addition to specified number of copies to Architect.
2. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed .pdf format file, or .pdf files within a .zip file where multiple files cannot be avoided, incorporating submittal requirements of a single Specification Section and transmittal form. Name file according to Submittal number and contents identification.
2. Architect, and Architect's consultants as applicable, will return electronic submittal with annotations containing their comments as applicable.
3. Architect retains right to require a paper submittal for shop drawings or other complex submittals that may require substantial notation to be marked on submittal sheets or drawings, at Architect's discretion.

G. Options: Circle or highlight options to be provided on product data and specification sheets. Identify options requiring selection by Architect with red colored boxes or text.

H. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. Organization: All required submittals for a specification section must be transmitted together complete as one submittal transmittal. Partial transmittals will not be accepted for review.

B. Contractor's responsibilities:
   1. Contractor shall thoroughly check shop drawings, project data and samples for compliance with Contract Documents and list variances prior to submission.
   2. Contractor represents by approving and submitting Shop Drawings, Product Data and samples that he has or will coordinate and verify dimensions, all materials, field measurements, field construction criteria, catalog numbers and similar data with requirements of work and of Contract Documents prior to submitting.
   3. Submittals shall bear Contractor's stamp and initials certifying that they have been checked. Submittals without stamp & initials shall be returned un-reviewed.
   4. Contractor's responsibility for deviations or errors and omissions in submittals is not relieved by Architect/ Engineer review of submittals, unless Architect/ Engineer gives specific written acceptance of specific deviations.
   5. Do not proceed with purchasing, fabrication or delivery of work which requires submittals until return of submittals with Architect/Engineer stamp and initials or signature evidencing final review and approval of submittals.
   6. Contractor is responsible for dimensions at job site, quantities, coordinating component parts and trades to effect unified construction and implement construction techniques, safety of incremental units, and satisfactory performance of work in accordance with Contract Documents.
   7. Delays caused by failure of Contractor to check shop drawings and to stamp with this approval shall be Contractor's responsibility.
   8. Coordinate preparation and processing of submittals with performance of work to avoid delays.
   9. No extension of time shall be allowed because of failure to properly coordinate and sequence submittals.

C. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Submit electronic submittals via email or FTP as PDF format electronic files.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Action Submittals: Submit paper copies of each submittal unless otherwise indicated. Architect and his consultants involved in review of each submittal will retain one copy each; and will annotate and return additional copies to Contractor.
   3. Informational Submittals: Submit **[electronic] [or] [two paper]** copies of each submittal unless otherwise indicated. Architect will not return copies.
   4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.

E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless the submittal is based on Architect's digital data drawing files, and is specifically permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches, but no larger than 30 x 42 inches .
3. Submit Shop Drawings in one of the following format**s**:
    a. PDF electronic file.
        1) Architect retains the right, at Architect's sole discretion, to require paper copies for submittals that may require extensive annotation on submittal sheets, and for oversize sheets or other conditions that may be difficult to review in electronic format. In each case, Architect and Architect's consultants involved in review will retain one copy each and return the remainder of copies with annotations.
    b. Opaque paper copies of each submittal. Architect and his consultants involved in review will retain one copy each; remainder will be returned.

F. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.

c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Unless otherwise indicated, submit **[one] <Insert number>** full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   b. Selector sheets printed by Contractor, and website information, are not acceptable samples for selection. Submit Manufacturer's selector sheets and samples with accurate color and texture representation as applicable.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Unless otherwise indicated, submit two sets of Samples. Architect will retain both Sample sets.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

G. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schedule in the following format:
      a. PDF electronic file.

2.02 INFORMATION SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
   2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   3. Test and Inspection Reports: Comply with requirements in Division 1 Section - Quality Requirements.

B. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section - Project Management and Coordination.

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section - Construction Progress Documentation.

D. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section - Payment Procedures.

E. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section - Quality Requirements.

F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section - Closeout Procedures.

G. Maintenance Data: Comply with requirements specified in Division 01 Section - Operation and Maintenance Data.

H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

O. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

Q. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

R. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.03 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section - Closeout Procedures.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. Action Submittals:
   1. Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
      a. No exceptions taken.
      b. Make corrections as noted.
      c. Revise and resubmit.
      d. Rejected.
      e. Other.
   2. Submittals or items stamped "No exceptions taken" indicates that Architect does not require resubmittal, and may include comments such as Architect's selection of options.
   3. Submittals or items stamped "Make corrections as noted" indicates that Architect does not require resubmittal if the annotated corrections are made. However, items or submittals with this action noted may require resubmittal if:
      a. Contractor believes indicated corrections are not correct responses, and requires subsequent review. Resubmittal should indicate Contractor's reasons for concern and additional supporting information as applicable.
      b. Contractor believes a resubmittal is required to address or confirm additional questions through subsequent review, related to items not considered by the original submittal or that were brought to light by Architect's previous review comments.
   4. Revise and resubmit items or submittals stamped "revise and resubmit" and "rejected", to address all comments requiring resubmittal and the reasons for rejection.
   5. When "Other" action is indicated, Architect will provide additional comment describing the subsequent action required.
   6. Submittals may be stamped with more than one action regarding portions of the submittal, and may note that only portions of the original submittal are required to be resubmitted.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

Advancement of Construction Technology

SUBMITTAL TRANSMITTAL

Project: _____ Date: _____

_____ A/E Project Number: _____

TRANSMITTAL A To (Contractor): _____ Date: _____ Submittal No. _____

From (Subcontractor): _____ By: _____ ☐ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

☐ Submitted for review and approval
☐ Resubmitted for review and approval
☐ Complies with contract requirements
☐ Will be available to meet construction schedule
☐ A/E review time included in construction schedule

☐ Substitution involved - Substitution request attached
☐ If substitution involved, submission includes point-by-point comparative data or preliminary details
☐ Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL B To (A/E): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

☐ Approved
☐ Approved as noted

☐ Revise / Resubmit
☐ Rejected / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL C To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____

From (A/E): _____ ☐ Other By: _____ Date Trnsmt'd by A/E: _____

☐ Approved
☐ Approved as noted
☐ Not subject to review
☐ No action required
☐ Revise / Resubmit
☐ Rejected / Resubmit
☐ Approved as noted / Resubmit

☐ Provide file copy with corrections identified
☐ Sepia copies only returned

☐ Point-by-point comparative data required to complete approval process

☐ Submission Incomplete / Resubmit

Other remarks on above submission:

☐ One copy retained by sender

TRANSMITTAL D To (Subcontractor): _____ Attn: _____ Date Rec'd by Contractor: _____

From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ One copy retained by sender

Copyright 1996, Construction Specifications Institute,
106 Madison Street, Alexandria, VA 22314-1791

September 1996
CSI Form 12.1A

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
   1. Division 1 Section - Allowances for testing and inspecting allowances.
   2. Division 1 Section - Construction Progress Documentation for developing a schedule of required tests and inspections.
   3. Division 1 Section - Cutting and Patching for repair and restoration of construction disturbed by testing and inspecting activities.
   4. Divisions 2 - 48 Sections for additional specific test and inspection requirements.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

E. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.05 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.06 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of the following regulations and retain at Project site to be available for reference by parties who have a reasonable need:
   1. Texas Accessibility Standards.

1.07 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.

9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
   1. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed, unless otherwise indicated.

1.09 QUALITY CONTROL

A. Owner Responsibilities: The Owner will hire and pay for tests and inspections, unless explicitly assigned to Contractor. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Contractor shall engage and pay for Mechanical HVAC systems testing adjusting and balancing services. Refer to Division 23 for Testing, Adjusting and Balancing specifications.
   2. Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   3. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged by Owner and a description of the types of testing and inspecting they are engaged to perform.
   4. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies, Engineer & Architect at least 72 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Architect**,** and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and re-inspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspections: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspections, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report of each test, inspection, and similar quality-control service to recipients on the distribution list as established by Architect, or in the absence of that, through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delete first subparagraph below if not required or common practice in Project vicinity.
6. Delivery of samples to testing agencies.
7. Preliminary design mix proposed for use for material mixes that require control by testing agency.
8. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EARTHWORK AND TESTING

A. Inspect and approve subgrade prior to placing material.

B. Perform relative compaction testing determined as outlined in ASTM D-1557.

C. Perform moisture density test for each soil type determined as outlined in ASTM D-698.

D. Field density tests shall be made at all fill areas at backfill and at existing subgrade; no less than two tests per lift.

E. Filling and Backfilling:
   1. The Contractor shall make available to the laboratory, adequate samples of each fill and backfill material from the proposed sources of supply not less than 10 days prior to the start of the work.
   2. The Laboratory shall analyze the samples as required to provide a soil description and to determine compliance with the quality requirements.
      a. Test for liquid limit in accordance with ASTM D423.
      b. Test for plastic limit of soils and plasticity index of soils in accordance with ASTM D424.
      c. Test for moisture density relations of soil in accordance with ASTM D698.
   3. Furnish a report for each individual test and state whether sample conforms to the specified requirements or reasons for nonconformance.
   4. Inspect and approve subgrade prior to placement of fill material.
   5. Make in-place compaction tests for moisture content, moisture-density relationship, and density of fill materials.
   6. Perform not less than two compaction tests for each 3,000 SF of surface for each layer of fill under the building and not less than two compaction tests for each 5,000 SF of surface for each layer of fill or undisturbed earth on areas of site to be covered by paving walks or traffic approaches.

3.02 CONCRETE REINFORCEMENT TESTING AND INSPECTION

A. Reinforcing Bar Inspection: Inspect reinforcing bar placement including size, number, configuration, locations, clearances, and related criteria.

B. Reinforcing: Inspect all reinforcing steel prior to placement of concrete for compliance with the Contract Documents and the approved shop drawings. All instances of noncompliance shall be immediately brought to the attention of the Contractor. If uncorrected by the contractor, they shall be listed in the report.
   1. Observe and report the following: number and size of bars; bending; splicing; clearance to forms; clearance between bars; rust, from oil or other contamination; fabrication and installation of embedded metal assemblies, including visual inspection of all welds.

C. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

3.03 CAST-IN-PLACE CONCRETE TESTING AND INSPECTION

A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Architect for final acceptance.

B. Testing agencies shall meet the requirements of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction", ASTM E-329-70.

C. The following review and testing services shall be performed by the designated laboratory:
   1. The testing laboratory shall review the submitted mix designs for conformance with "Building Code Requirements for Structural Concrete" ACI 318-95.
   2. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" ASTM C172, Current Edition.
   3. Mold and cure five specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexural Specimens in the Field", ASTM C31, Current Edition.
   4. Test specimens in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders", ASTM C39, Current Edition. Two specimens shall be tested at 28 days for acceptance and two shall be tested at 7 days for information. The remaining cylinder shall be tested as directed.
   5. Make one strength test for each 100 cubic yards or fraction thereof, of each mix design or concrete placed in any one day.
   6. Determine slump for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete" ASTM C143, Current Edition and air content of normal weight or light weight concrete sample for each strength test.
   7. Determine temperature of concrete sample for each strength test.
   8. Other testing services needed or required shall be paid by the Contractor.
   9. Inspect and control the concrete mixing and loading of transit-mix trucks at the plant at the start of each day's mixing. Check mixing from mixers before mix begins to set and within time limits set forth in ASTM C94. Prevailing conditions shall be compared to the criteria indicated on the appropriate design mix (temperature, moisture, condition of aggregates, etc.).
   10. Any significant deviance shall be immediately reported to the Architect and the design laboratory and corresponding adjustments to the mix made before any materials are discharged.
   11. Control the addition of water to the concrete at the job site and the length of time the concrete is allowed to remain in the truck during the pour.
   12. Specimens for pumped concrete shall be taken at the discharge and of pumping equipment.
   13. Certify each delivery ticket indicating class of concrete delivered (or poured), amount of water added and the time at which the cement and aggregate was discharged into the truck, and the time at which the concrete was discharged from the truck.

D. Provide and maintain for the use of the testing agency adequate facilities for proper curing of concrete test specimens on the project site in accordance with "Methods of Making and Curing Concrete Compression and Flexural Specimens in the Field" ASTM C31, Current Edition.

E. Evaluation and Acceptance:
   1. The strength level of the concrete will be considered satisfactory if 90% of the strength test results and the averages of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.

2. Completed concrete work will be accepted when the requirements of "Specifications for Structural Concrete for Buildings" ACI 301-84, Chapter 18 have been complied with.
3. In any case, where the average strength of the laboratory control cylinders, as shown by the tests for any portion of the structure, falls below the minimum ultimate compressive strength hereinbefore specified, the Architect shall have the right to require the Contractor to provide improved curing conditions of temperature and moisture to secure the required strength. Also, if the average strength of the laboratory control cylinders should fall so low as to cause the portions of the structure to which the respective unsatisfactory test reports apply to be in question by the Architect, the Contractor shall follow the core procedure set forth in the current edition of ASTM Designation C42. If the results of the core tests indicate, in the opinion of the Architect, that the strength of the structure is inadequate, such replacement, load testing, or strengthening as may be ordered by the Architect shall be provided by the Contractor without cost to the Owner.
4. The testing laboratory shall control field adjustments made to concrete mixes to compensate for field conditions and report same.
5. Wherever the testing laboratory recognizes a trend of decreasing quality in the concrete due to changing reasons, conditions of curing or other cause; this shall be brought to the attention of the Architect, along with a recommendation for corrective action to be taken before the materials fall below the requirements of these Specifications.

F. Reports: In addition, the testing laboratory shall make one copy of the reports to the concrete supplier.

3.04 INSPECTING STRUCTURAL STEEL

A. Field Inspection
1. Proper erection of all pieces.
2. Proper installation of all bolts, including checking the calibration of impact wrenches used with high strength bolts.
3. Plumbness of structure and proper bracing.
4. Ultrasonic inspection of all full penetration welds.
5. Record and measure camber of beams upon arrival and before erection with compliance with the specified camber. Measure beam lying flat with web in the horizontal position. Members outside the specified camber tolerance shall be returned to the shop.

B. Qualification of Welders: Before assigning any welder to work covered by this section of the Specifications, the fabricator shall provide the Testing Laboratory with certification that each of the the welders to be employed on the project has passed qualification tests within the last year using procedures covered in the American Welding Society Standard D1.0-63.

C. The contractor shall be responsible for furnishing fabrication and erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6. Submit records of inspections and tests to the Owner’s testing laboratory for their review.

D. Inspection of shop and field welding shall be “verification inspection” in accordance with Section 6 of AWS D1.1 and as follows:
1. Visually inspect the welding of all shop fabricated members and note the location of all cover plates, connectors, bearing stiffeners, splices, and fillet welds for proper return around ends and check for seams, folds, and delamination.
2. Ultrasonically test all full penetration welds in accordance with ASTM E164.
3. Root passes shall be thoroughly be inspected for cracks. All cracks shall be gouged out and rewelded to two inches beyond each end of the crack.
4. Mark all welds requiring repairs and make reinspections.

5. The Testing Laboratory inspector shall advise the Owner and Architect of any shop and/or field conditions which, in his opinion, may require further tests and examination. Such further tests shall be performed as authorized by the Owner and Architect.
6. The Owner reserves the right to use ultrasonic or radiographic inspection to verify the adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.

E. Inspection of bolted construction shall be in accordance with AISC "Specification for Structural Steel Buildings" and as follows:
1. All bolts shall be visually inspected to ensure that the plies have been brought into "snug" contact.
2. High strength bolts shall be inspected in accordance with Section 9 of the AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts." Bolts are to be fully torqued as required by the AISC specification.
3. For all high strength bolts, the inspector shall observe the required jobsite testing and calibration, and shall confirm that the procedure to be used provides the required tension.

3.05 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Comply with the Contract Document requirements for Division 1 Section - Cutting and Patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built. Refer to Division 01 "Work Restrictions".

1.03 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are

minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.04 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
   1. Where abbreviations and acronyms used in Specifications or other Contract Documents are not listed, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

AABC	Associated Air Balance Council www.aabc.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.americanbearings.org	(202) 367-1155
ACI	American Concrete Institute (Formerly: ACI International) www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AHRI	Air-Conditioning, Heating, and Refrigeration Institute (The) www.ahrinet.org	(703) 524-8800
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559

AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(607) 256-3313
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute (See AHRI)	
ARI	American Refrigeration Institute (See AHRI)	
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Safety Engineers (The) www.asse.org	(847) 699-2929
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWEA	American Wind Energy Association www.awea.org	(202) 383-2500
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWMAC	Architectural Woodwork Manufacturers Association of Canada www.awmac.com	(403) 453-7387
AWPA	American Wood Protection Association (Formerly: American Wood-Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.gobrick.com	(703) 620-0010
BICSI	BICSI, Inc.	(800) 242-7405

	www.bicsi.org	(813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
BWF	Badminton World Federation (Formerly: International Badminton Federation) www.bwfbadminton.org	60 3 9283 7155
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CFSEI	Cold-Formed Steel Engineers Institute www.cfsei.org	(866) 465-4732 (202) 263-4488
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(404) 622-0073
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.org	(706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(800) 328-6306 (847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
CWC	Composite Wood Council (See CPA)	
DASMA	Door and Access Systems Manufacturers Association www.dasma.com	(216) 241-7333
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
ECA	Electronic Components Association www.ec-central.org	(703) 907-8024
ECAMA	Electronic Components Assemblies & Materials Association (See ECA)	

EIA	Electronic Industries Alliance (See TIA)	
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (703) 538-1616
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ESTA	Entertainment Services and Technology Association (See PLASA)	
EVO	Efficiency Valuation Organization www.evo-world.org	(415) 367-3643 44 20 88 167 857
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council U.S. www.fscus.org	(612) 353-4511
GA	Gypsum Association www.gypsum.org	(301) 277-8686
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
HI	Hydraulic Institute www.pumps.org	(973) 267-9700
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association (See AHRI)	
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAPSC	International Association of Professional Security Consultants www.iapsc.org	(415) 536-0288
IAS	International Approval Services (See CSA)	
ICBO	International Conference of Building Officials (See ICC)	
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (202) 370-1800
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICPA	International Cast Polymer Alliance www.icpa-hq.org	(703) 525-0511
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission	41 22 919 02 11

	www.iec.ch	
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IES	Illuminating Engineering Society (Formerly: Illuminating Engineering Society of North America) www.ies.org	(212) 248-5000
IESNA	Illuminating Engineering Society of North America (See IES)	
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 981-0100
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
IGSHPA	International Ground Source Heat Pump Association www.igshpa.okstate.edu	(405) 744-5175
Intertek	Intertek Group (Formerly: ETL SEMCO; Intertek Testing Service NA) www.intertek.com	(800) 967-5352
ISA	International Society of Automation (The) (Formerly: Instrumentation, Systems, and Automation Society) www.isa.org	(919) 549-8411
ISAS	Instrumentation, Systems, and Automation Society (The) (See ISA)	
ISFA	International Surface Fabricators Association (Formerly: International Solid Surface Fabricators Association) www.isfanow.org	(877) 464-7732 (801) 341-7360
ISO	International Organization for Standardization www.iso.org	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association (See ISFA)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (See CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MMPA	Moulding & Millwork Producers Association (Formerly: Wood Moulding & Millwork Producers Association) www.wmmpa.com	(800) 550-7889 (530) 661-9591
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.org	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6223 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NHLA	National Hardwood Lumber Association www.nhla.com	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association (See NWFA)	
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSPE	National Society of Professional Engineers www.nspe.org	(703) 684-2800
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736
NWFA	National Wood Flooring Association	(800) 422-4556

	www.nwfa.org	(636) 519-9663
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PLASA	PLASA (Formerly: ESTA - Entertainment Services and Technology Association) www.plasa.org	(212) 244-1505
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(706) 882-3833
RIS	Redwood Inspection Service www.redwoodinspection.com	(925) 935-1499
SAE	SAE International (Society of Automotive Engineers) www.sae.org	(877) 606-7323 (724) 776-4841
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	
SCTE	Society of Cable Telecommunications Engineers www.scte.org	(800) 542-5040 (610) 363-6888
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 293-1995
SMA	Screen Manufacturers Association www.smainfo.org	(773) 636-0672
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SRCC	Solar Rating and Certification Corporation www.solar-rating.org	(321) 638-1537
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265

SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWPA	Submersible Wastewater Pump Association www.swpa.org	(847) 681-1868
TCA	Tilt-Up Concrete Association www.tilt-up.org	(319) 895-6911
TCA	Tile Council of America (See TCNA)	
TCNA	Tile Council of North America, Inc. (Formerly: Tile Council of America) www.tileusa.com	(864) 646-8453
TEMA	Tubular Exchanger Manufacturers Association, Inc. www.tema.org	(914) 332-0040
TIA	Telecommunications Industry Association (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance) www.tiaonline.org	(703) 907-7700
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance (See TIA)	
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UBC	Uniform Building Code (See ICC)	
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association www.wcmanet.org	(212) 297-2122
WDMA	Window & Door Manufacturers Association www.wdma.com	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association (See MMPA)	
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 938-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut für Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, LLC www.icc-es.org	(800) 423-6587 (562) 699-0543

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce National Institute of Standards and Technology www.nist.gov	(301) 975-4040
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-2664
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FG	Federal Government Publications www.gpo.gov	(202) 512-1800
GSA	General Services Administration www.gsa.gov	(800) 488-3111 (202) 619-8925
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory Environmental Energy Technologies Division http://eetd.lbl.gov	(510) 486-4000
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742
TRB	Transportation Research Board National Cooperative Highway Research Program www.trb.org	(202) 334-2934
USDA	Department of Agriculture Rural Utilities Service www.usda.gov	(202) 720-2791
USDJ	Department of Justice Office of Justice Programs National Institute of Justice www.ojp.usdoj.gov	(202) 307-0703
USP	U.S. Pharmacopeia	(800) 227-8772

	www.usp.org	(301) 881-0666
USPS	United States Postal Service www.usps.com	(202) 268-2000

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ABA /	Architectural Barriers Act	(800) 872-2253
ADA /	Americans with Disabilities Act	
ADAAG	Americans with Disabilities Act Accessibility Guidelines *Administered by the* United States Access Board http://www.access-board.gov/	
CFR	Code of Federal Regulations	(866) 512-1800
	Available from Government Printing Office www.gpo.gov/fdsys	(202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
FED-STD	Federal Standard (See FS)	
FS	Federal Specification	(215) 697-2664
	Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	
	Available from Defense Standardization Program www.dsp.dla.mil	
	Available from General Services Administration www.gsa.gov	(800) 488-3111 (202) 619-8925
	Available from National Institute of Building Sciences/Whole Building Design Guide www.wbdg.org/ccb	(202) 289-7800
MILSPEC	Military Specification and Standards (See DOD)	
TAS	Texas Accessibility Standards *Administered by the* Texas Department of Licensing and Registration http://www.tdlr.texas.gov/ab/ab.htm	(512) 539 5669
UFAS	Uniform Federal Accessibility Standards *Administered by the* United States Access Board http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas	(800) 872-2253
USAB	United States Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
USATBCB	U.S. Architectural & Transportation Barriers Compliance Board (See USAB)	

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California Department of Consumer Affairs Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation www.bearhfti.ca.gov	(800) 952-5210 (916) 574-2041

CCR	California Code of Regulations Office of Administrative Law California Title 24 Energy Code www.calregs.com	(916) 323-6225
CDHS	California Department of Health Care Services (Formerly: California Department of Health Services) (See CCR)	
CDPH	California Department of Public Health Indoor Air Quality Program www.cal-iaq.org	
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(800) 848-5580 (415) 703-2782
SCAQMD	South Coast Air Quality Management District www.aqmd.gov	(909) 396-2000
TCEQ	Texas Commission on Environmental Quality http://www.tceq.state.tx.us/	(512) 239-1000
TDLR	Texas Department of Licensing and Registration http://www.tdlr.texas.gov/index.htm	(800) 803-9202
TFS	Texas Forest Service Forest Resource Development and Sustainable Forestry http://txforestservice.tamu.edu	(979) 458-6606
TxDOT	Texas Department of Transportation www.txdot.gov	(800) 558-9368

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
   1. Sewers and drainage.
   2. Water service and distribution.
   3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   4. Heating and cooling facilities.
   5. Ventilation.
   6. Electric power service.
   7. Lighting.
   8. Telephone service.

C. Support facilities include, but are not limited to, the following:
   1. Temporary roads and paving.
   2. Dewatering facilities and drains.
   3. Project identification and temporary signs.
   4. Waste disposal facilities.
   5. Field offices.
   6. Storage and fabrication sheds.
   7. Lifts and hoists.
   8. Temporary elevator usage.
   9. Temporary stairs.
   10. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
   1. Environmental protection.
   2. Stormwater control.
   3. Tree and plant protection.
   4. Pest control.
   5. Site enclosure fence.
   6. Security enclosure and lockup.
   7. Barricades, warning signs, and lights.
   8. Covered walkways.
   9. Temporary enclosures.
   10. Temporary partitions.
   11. Fire protection.

E. Related Sections include the following:
   1. Division 1 Section - Submittal Procedures for procedures for submitting copies of implementation and termination schedule and utility reports.
   2. Division 1 Section - Execution Requirements for progress cleaning requirements.
   3. Divisions 2 through 48 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.03 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.04 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
   1. Owner's maintenance personnel.
   2. Occupants of Project.
   3. Architect.
   4. Testing agencies.
   5. Personnel of authorities having jurisdiction.

B. Sewer Service: If necessary, use sewer service from Owner's municipal utility services free of charge.

C. Water Service: Use water from Owner's municipal utility services without metering and without payment of use charges.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.05 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.06 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.07 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
   1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

C. Portable Chain-Link Fencing: Minimum 2-inch 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

D. Lumber and Plywood: Comply with requirements in Division 6 Section - Carpentry.

E. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

G. Paint: Comply with requirements in Division 9 Section - Painting.

H. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

I. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

J. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches

K. Water: Potable.

2.02 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Prefabricated Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and tack & marker boards.
   3. Drinking water and private toilet.
   4. Coffee machine and supplies.
   5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
   6. Lighting fixtures capable of maintaining average illumination of 20 fc.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

E. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

F. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

G. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

H. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of [8] at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section - Closeout Procedures.

I. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

J. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
   2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
   3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Water Service: Provide temporary water service as required for construction.
1. Provide rubber hoses as necessary to serve Project site.
2. Install water service and distribution piping in sizes and pressures adequate for construction.
3. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
4. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
5. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities. Existing sanitary facilities and new sanitary facilities shall not be used by contractor personnel.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
3. Toilets: Install toilet facilities connected to local water and sewer lines. Provide lavatories, mirrors, urinals, and water closets. Provide only potable-water connections. Provide individual compartments for water closets. Provide suitable enclosure with nonabsorbent sanitary finish materials and adequate heat, ventilation, and lighting.
4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
   a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
5. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Distribution: Provide temporary electric power service as required for construction, including receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
4. Provide metal conduit enclosures or boxes for wiring devices.
5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
6. Install lighting for Project identification sign.

H. Telephone Service: Furnish superintendent with a portable cellular telephone for use in making and receiving telephone calls when away from field office.

I. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Contractor, Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
1. Processor: Intel Quad-Core, 4.0 GHz processing speed.
2. Memory: 4 gigabyte.
3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
4. Display: 22-inch LED monitor with 256-Mb dedicated video RAM.
5. Full-size keyboard and mouse.
6. Network Connectivity: 10/100BaseT Ethernet.
7. Operating System: Microsoft Windows 8.1 or higher.
8. Productivity Software:
    a. Microsoft Office, including Word, Excel, and Outlook.
    b. Adobe Reader 11.0 or higher.
    c. WinZip 17.0 or higher.
9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, or separate units for each of these functions.
10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 25 Mbps upload and 25 Mbps download speeds at each computer.
11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
12. Backup: External hard drive, minimum 80 gigabyte, with automated backup software providing daily backups.

J. Digital Camera: Provide a digital camera for superintendant to transmit photographs to Architect & Owner.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

C. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas [as indicated] [within construction limits indicated] on Drawings.
   1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install sub-base and base for temporary roads and paved areas according to Division 31 Section - Earth Moving.
   3. Recondition base after temporary use, including removing contaminated material, re-grading, proof-rolling, compacting, and testing.
   4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section - Asphalt Paving.

E. Dewatering Facilities and Drains: Comply with requirements in applicable sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
   2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
   3. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
   1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
   2. Prepare temporary signs to provide directional information to construction personnel and visitors.
   3. Construct signs of exterior-type Grade B-B high-density concrete-form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.

4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
5. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section - Execution Requirements for progress cleaning requirements. Comply with requirements specified in Division 1 Section - Construction Waste Management and Disposal.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

H. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

I. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.
1. Furnish and equip offices as follows:
   a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
   b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
   c. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- square tack board.
2. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
3. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

J. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

K. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
1. Existing Elevator Usage: Use of Owner's existing elevators will be not be permitted.

L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section - Site Clearing.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion and sedimentation control drawings or requirements of authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
   1. Set fence posts in concrete bases.
   2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
   3. Option in subparagraph below is only for projects connected to existing construction.
   4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

H. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each day.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

J. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
   1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
   2. Vertical Openings: Close openings of 25 sq. ft.or less with plywood or similar materials.
   3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
   4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
   5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.

L. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise. Prevent from entering occupied areas.
   1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
   2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inchstuds, 2 layers of 3-milpolyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inchesup the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inchfire-retardant plywood.
      a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
   3. Insulate partitions to provide noise protection to occupied areas.
   4. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   5. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   6. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
   7. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   8. Protect air-handling equipment.
   9. Weatherstrip openings.

M. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
    a. Field Offices: Class A stored-pressure water-type extinguishers.
    b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
    c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Provide temporary key boxes and knox padlocks for gates and secured areas throughout construction as required by authorities having jurisdiction.
4. Prohibit smoking in construction areas.
5. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
6. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
7. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
8. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
9. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.05 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
    1. Protect porous materials from water damage.
    2. Protect stored and installed material from flowing or standing water.
    3. Keep porous and organic materials from coming into prolonged contact with concrete.
    4. Remove standing water from decks.
    5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
    1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
    2. Keep interior spaces reasonably clean and protected from water damage.
    3. Periodically collect and remove waste containing cellulose or other organic matter.
    4. Discard or replace water-damaged material.
    5. Do not install material that is wet.
    6. Discard, replace, or clean stored or installed material that begins to grow mold.
    7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system to control humidity.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits:
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section - Closeout Procedures.

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 1 Section - Allowances for products selected under an allowance.
   2. Division 1 Section - Alternates for products selected as an alternate.
   3. Division 1 Section - Substitutions for products selected as a substitute.
   4. Division 1 Section - References for applicable industry standards for products specified.
   5. Division 1 Section - Closeout Procedures for submitting warranties for contract closeout.
   6. Divisions 2 - 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.03 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.04 SUBMITTALS

A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Specification Section number and title.
      b. Generic name used in the Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date or time span of delivery period.
      h. Identification of items that require early submittal approval for scheduled delivery date.
   3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
      a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
   4. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   5. Architect's Action: Architect will respond in writing to Contractor within 15 working days of receipt of completed product list if there are objections to the list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section - Submittal Procedures. Show compliance with requirements.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
9. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
10. Protect stored products from damage and liquids from freezing.
11. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section - Closeout Procedures.

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal", "or approved equal", "or approved," or “acceptable substitution”, comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   a. Substitutions may be considered, unless otherwise indicated.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
   a. Substitutions may be considered, unless otherwise indicated.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.

a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
11. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
    1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
    2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    3. Evidence that proposed product provides specified warranty.
    4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
    5. Samples, if requested.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.01 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.

1.02 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. Division 01 Section - Summary for limits on use of Project site.
   2. Division 01 Section - Submittal Procedures for submitting surveys.
   3. Division 01 Section - Cutting and Patching for cutting and patching necessary for installation or performance of other components of the work.
   4. Division 01 Section - Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   5. Division 07 Section - Penetration Firestopping for patching penetrations in fire-rated construction.

1.03 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.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor 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.

1.05 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
        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.
    2. 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 that 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.
    3. 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

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.
   1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Division 01 sustainable design requirements Section.

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

3.01 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, 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.
   3. In the event of any inconsistency or conflict, between existing conditions and the bidding documents, immediate notice of such inconsistency or conflict shall be given to the Architect. Do not undertake any phase of the work affected by such inconsistency or conflict, pending the issuance of instructions by the Architect.

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.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility or 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 Division 01 Section - Project Management and Coordination.

3.03 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 promptly.

B. General: Engage a land surveyor 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 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. Elevations of existing grades, floors, tops of walls, parapets, beams and locations of existing columns, walls and the like are based on survey documents or on drawings of the existing building furnished by the Owner. The Architect assumes no responsibility for the accuracy of the information on existing drawings. It is the intent of the Contract Drawings to integrate new work with existing improvements and for the Contractor to verify actual conditions.

E. 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.

F. Subcontractors shall verify with the General Contractor the exact field location of all rough-in dimensions, taking into account location of walls, partitions and equipment. Special attention should be paid to clearances as required for compliance with American's with Disabilities Act Accessibility Guidelines (ADAAG) in the state having jurisdiction, including any applicable revisions. Any cost in relocation of items due to that subcontractor's error, will be borne by him at no additional cost to the Owner.

G. Where equipment involving more than one subcontractor is installed at a common location and no specific location has been determined, it is the Contractor's responsibility to check with the Architect for the actual rough-in dimensions for such equipment. If for some reason the rough-in has not been checked and a subcontractor has installed his equipment, remaining subcontractors shall align their equipment as closely as possible to the installed equipment. Alignment shall mean centered vertically, equally space and centered horizontally. This alignment applies to bells, alarms, thermostats, switches, handles, access panels, etc. Any items not installed in alignment shall be relocated by the Contractor at his own expense with damaged surfaces properly repaired.

H. 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.

3.04 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. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect 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.

3.05 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 inch in occupied spaces and 90 inch 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.

3.06 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 Division 01 Section - Summary.

F. 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 Division 31 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.

G. 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.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 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. Preinstallation 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.

3.08 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 Division 01 Section - 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.

3.09 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section - General Commissioning Requirements.

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section - 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.

C. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section - Cutting and Patching.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

D. Restore permanent facilities used during construction to their specified condition.

E. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

F. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

G. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

Advancement of Construction Technology

REQUEST FOR INFORMATION

Project: _____ R.F.I. Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Section: Paragraph: Drawing Reference: Detail:

Request:

Signed by: Date:

Response:

☐ Attachments

Response From: To: Date Rec'd: Date Ret'd:

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

Copyright 1994, Construction Specifications Institute,
601 Madison Street, Alexandria, VA 22314-1791

July 1994
CSI Form 13.2A

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Division 01 Section - Photographic Documentation for submitting final completion construction photographic documentation.
   2. Division 01 Section - Execution Requirements for progress cleaning of Project site.
   3. Division 01 Section - Operation and Maintenance Data for operation and maintenance manual requirements.
   4. Division 01 Section - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.
   5. Division 01 Section - Demonstration and Training for requirements for instructing Owner's personnel.
   6. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.06 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
   5. Submit test/adjust/balance records.
   6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   3. Complete startup and testing of systems and equipment.
   4. Perform preventive maintenance on equipment used prior to Substantial Completion.
   5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
   6. Advise Owner of changeover in heat and other utilities.
   7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
   8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   9. Complete final cleaning requirements, including touchup painting.
   10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for final completion.

1.07 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment according to Division 01 Section - Payment Procedures.
   2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.08 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Page number.
   4. Submit list of incomplete items in the following format:
      a. PDF electronic file. Architect will return annotated file.

1.09 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within [**15**] <**Insert number**> days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize entire collection of approved warranty documents into an orderly sequence based on the table of contents of Project Manual, with tabs between CSI division sections; i.e.; group all Division-7 building components under one tab, group all Division-8 components under another tab, etc.. Utilize CSI specification sections 2 through 33 for each division tab. Provide **three** copies of each Final Warranty binder.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide title page, Contractor's general One-Year Warranty (corrective period) with agreed upon date and signature of authorized representative, table of contents, and subcontractor list at the beginning of each binder.
3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
5. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals. Such copies shall be identical to the warranties included in the warranty binders, but may be photocopies including for warranties that require wet signatures for the original actuated copies.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

3.02 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

01 77 00A - SUBSTANTIAL COMPLETION READINESS CHECKLIST

Substantial Completion means the date determined and certified by the Contractor, Architect, and Owner when the Work, or a designated portion thereof, is sufficiently complete, in accordance with the Contract, so as to be operational and fit for the use intended. When requesting Architect's Inspection for Substantial Completion, the Contractor shall provide not less than 7 working days advance notice to the Architect and Owner (unless otherwise mutually agreed). Contractor shall submit the following checklist indicating readiness for the Inspection, and all accompanying documentation indicated, not less than 7 days prior to the requested date for Architect's inspection for Substantial Completion. Fill out form completely, including comments indicating reasons for incomplete items and anticipated completion as applicable. Architect will provide editable version upon request. Deficiencies in one or more items does not necessarily indicate that project is not ready for inspection. Deficiencies shall be reflected in Contractor's punch list. The Architect's inspection for substantial completion shall not be scheduled on a day when fire alarm testing or other extremely noisy construction activities are scheduled.

Item	Y	N	N/A	Documents / Actions Required
1				**Contractor's Punch List (and Habitual Punch List Items Checked)** *Submit Contractor's Punch List, noting all remaining work items with date scheduled for completion or correction. Contractor shall update and submit / re-submit list as applicable minimum of 2 days and maximum of 5 days prior to the requested date for Architect's Inspection, noting items contractor has corrected and that are still pending. Additionally, Contractor shall field verify the following habitual check list items in preparing the Contractor's Punch List, and indicate that they have been verified by the checklist below:*
	Comments:			
				Confirm there are no outstanding items on the Contractor's Punch List that would adversely affect the Owner's beneficial occupancy.
	Comments:			
				Confirm that all outstanding items on Contractor's Punch List can be completed, and are scheduled for completion, within a maximum of 30 calendar days, or other duration as allowed by the Contract Documents or mutually agreed between Contractor, Architect, and Owner.
	Comments:			
				The area of the Facility included in the Contractor's Work has been, or will be by the requested date, completely cleaned and ready for Architect's Inspection.
	Comments:			
				Temporary Facilities have been removed, or will be removed, by requested date of Inspection (except for any items otherwise mutually agreed to remain after the date of Owner's beneficial occupancy).
	Comments:			
				All paving sealants installed, and zip strips removed where applicable.
	Comments:			
				All millwork / cabinets checked that all hardware is installed. Doors, drawers and moving parts checked for smooth operation through full range of motion. Hinges adjusted for alignment of adjacent doors.
	Comments:			

				Remove loose fasteners and debris from roofs, parking lot, and site.
	Comments:			
				All door and window hardware installed by Contractor checked for missing items.
	Comments:			
				All operable windows checked for smooth operation through full range of movement. Locking devices all aligned and properly engage. Screens installed where applicable.
	Comments:			
				All door silencers in place. Soiled / painted silencers replaced with new.
	Comments:			
				All doors / hardware installed by Contractor checked for proper operation. *This includes but is not limited to: Proper latching and locking operation, doors not binding on hinges or in door frames, closers and pivots adjusted to self-close and latch, and to operate in compliance with Texas Accessibility Standards, hold-opens verified adjusted for operation and release, hold-open function in closers tested where applicable, flush bolts throw fully into frames and floors, and proper operation of electronic hardware. Contractor's final submission of Contractor's punch list prior to Inspection shall include any observed deficiencies.*
	Comments:			
				All overhead doors and other mechanically operated doors, thoroughly checked for proper adjustment and operation of all control functions, binding in tracks, and any other deficiencies. Corrections made as required.
	Comments:			
				Check all ceiling tile for nicks, stains, and other damage, and replace with new as required. Check new ceiling grid for warp and damage and repair as required. Verify all tile is seated in the grid.
	Comments:			
				All interior finishes work complete and ready for Architect's inspection (other than minor touch-up).
	Comments:			
				All interior signage installed and accounted for.
	Comments:			
				All equipment and appliances installed by Contractor tested for proper adjustment and operation.
	Comments:			
				All pipes labeled as required by Contract Documents.
	Comments:			
				All exposed pipe penetrations checked for sealants (fire sealant where applicable), and escutcheons, as required by Contract Documents.
	Comments:			

				Remove all faucet aerators, flush lines of dirt, sand, and debris, and reinstall aerators. Test all faucet handles for correct hot and cold line connection / control.
	Comments:			
				Water closets and urinal fixtures tested for proper flush operation.
	Comments:			
				HVAC is functioning and humidity control is acceptable.
	Comments:			
				Fans operating correctly including their controls.
	Comments:			
				HVAC Filters to be replaced just prior to substantial completion with new filters.
	Comments:			
				HVAC ducts checked for construction dust and debris contamination and cleaned as applicable in compliance with requirements of the Contract Documents.
	Comments:			
				Electrical panels / schedules completely filled out and labeled, in compliance with Contract Documents. (*And other devices and circuits labeled where required by Contract Documents*)
	Comments:			
				Check all open electrical boxes have cover plates and screws, and painted where applicable.
	Comments:			
				Test all power outlets and switches.
	Comments:			
				Test all data outlets (if installed by this Contract)
	Comments:			
				Verify water heaters are installed with proper disconnects.
	Comments:			
				All lighting and lighting control systems have been tested for proper operation. Vacancy and occupancy sensors adjusted to proper duration and tested for sensitivity. Debug / repair as required. Replace burned out or inoperable lamps / modules as required by Contract Documents.
	Comments:			
				All landscaping, turf, and irrigation (*or temporary irrigation as applicable*) has been or will be installed / seeded by the requested date for Architect's inspection. *(Except as otherwise agreed or otherwise required due to planting season Note any pending installation on Contractor's punch list.)*
	Comments:			

2				**Final Inspections** All required final inspections have or will be passed by date of substantial completion (local and State). *Or, if any will be remaining the status will not affect Owner's beneficial occupancy and has been agreed to be acceptable by Owner.*
	Comments:			
3				**Certificate of Occupancy** A Certificate of Occupancy has been or will be issued by the requested date for inspection. *Or if not, a Temporary Certificate of Occupancy has been issued, and any outstanding items will not affect beneficial occupancy and are scheduled for correction and final inspection within 30 days or less.*
	Comments:			
4				**Owner Notification** Owner has been notified by Contractor with adequate time of pending changeover in utilities, insurance and building and site security, in accordance with the Contract Documents.
	Comments:			
5				**Extra Materials** All extra materials, attic stock, and maintenance tools required by the construction documents to be provided by Contractor have been delivered to Owner (submit transmittals indicating each item, quantities and receipt). *Any outstanding extra materials not yet delivered are acceptable to Owner for beneficial occupancy and are noted in Contractor's punch list, with anticipated delivery dates*.
	Comments:			
6				**Final Keying** Final key cores and keys as applicable to project scope have or will be installed, or have been delivered Owner's installer, in time for the requested date of substantial completion. This includes all keys for any locking cabinets, lockers, toilet accessories, etc. as applicable.
	Comments:			
7				**Security and Access Control** Applicable intrusion detection, security camera, access control, gate operators, and similar systems required for access and security are or will be operational in time for requested date for substantial completion. *(Where these systems are not the installed as part of this contract, Contractor has made due effort to coordinate with Owner's separate contract or vendor for timely completion).*
	Comments:			
8				**Owner Training** All Owner training required by the Contract Documents has been scheduled with Owner, or Owner Training Conference has been conducted and Owner has agreed that any training that will not be performed by the date of substantial completion is acceptable for beneficial occupancy.
	Comments:			

9				**Testing and Balancing Report** A copy of the initial HVAC testing and balancing report has been submitted to the Architect. *Any deficiencies are included in Contractor's punch list, and corrections and re-testing scheduled within the allowable duration for Final Completion.*
	Comments:			
10				**Record Drawings** To the best of Contractor's knowledge, annotations on record drawings are up to date. Preliminary review copy of marked up Record Drawings has been or will be submitted to Architect for review prior to the requested date for inspection.
	Comments:			
11				**Operations and Maintenance Manuals** Preliminary review copy of O&M binders has been or will be submitted to Architect for review prior to the requested date for inspection.
	Comments:			
12				**Record Submittals / Product Data** Preliminary review copy of project Record Submittals (if required) has been or will be submitted to Architect for review prior to the requested date for inspection.
	Comments:			
13				**Warranties Binder** Preliminary review copy of warranties binder has been or will be submitted to Architect for review prior to the requested date for inspection.
	Comments:			
14				**Roofing Manufacturer's Warranty Inspection** Roofing manufacturer's inspection has been performed and Roof Warranty has been achieved by requested date for inspection. *Or if warranty is not achieved, only minor corrections remain to achieve warranty, and submit Manufacturer's deficiency list/report with Contractor's punch list.*
	Comments:			

END OF SECTION 01 77 00A

Advancement of Construction Technology

PUNCH LIST

Project: _____

_____

To (Contractor): _____

_____

From (A/E): _____

Site Visit Date: _____

A/E Project Number: _____

Contract For: _____

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

Copyright 1996, Construction Specifications Institute,
601 Madison Street, Alexandria, VA 22314-1791

September 1996
CSI Form 14.1A

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Division 01 Section - Submittal Procedures for submitting copies of submittals for operation and maintenance manuals.
   2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.03 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.
   2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.

1. Correct or revise each manual to comply with Architect's comments. Submit three Final copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Subcontractor list
   4. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Construction Manager.
   7. Name and contact information for Architect.
   8. Name and contact information for Commissioning Authority.
   9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Subcontractor List: Organize subcontractor list by CSI specification section, as listed in the Project Manual table of contents. Provide contact name, street address (no P.O. Box numbers) and contact phone and fax number. If changes were made during the course of the project, utilize final contract company for each component of the work. List all contractors used on project, even if subcontracted to a different subcontractor, i.e; if earthwork subcontractor is contracted by the paving subcontractor, list both subcontractors.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.

5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Bonds: Include copies of bonds and lists of circumstances and conditions that would affect validity of bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Division 01 Section - Project Record Documents.

G. Comply with Division 01 Section - Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Division 01 Section - Closeout Procedures for general closeout procedures.
   2. Division 01 Section - Operation and Maintenance Data for operation and maintenance manual requirements.
   3. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.03 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or [Construction] [Work] Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
   1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
   2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Annotated PDF electronic file [with comment function enabled].
   3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
   4. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.02 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.03 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, record Specifications and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 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.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Requirements:
   1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.03 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.04 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Operations manuals.
      c. Maintenance manuals.
      d. Project record documents.
      e. Identification systems.
      f. Warranties and bonds.
      g. Maintenance service agreements and similar continuing commitments.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on meaning of warnings, trouble indications, and error messages.
      b. Instructions on stopping.
      c. Shutdown instructions for each type of emergency.
      d. Operating instructions for conditions outside of normal operating limits.
      e. Sequences for electric or electronic systems.
      f. Special operating instructions and procedures.
   4. Operations: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.
      d. Regulation and control procedures.
      e. Control sequences.
      f. Safety procedures.
      g. Instructions on stopping.
      h. Normal shutdown instructions.
      i. Operating procedures for emergencies.
      j. Operating procedures for system, subsystem, or equipment failure.
      k. Seasonal and weekend operating instructions.
      l. Required sequences for electric or electronic systems.
      m. Special operating instructions and procedures.
   5. Adjustments: Include the following:
      a. Alignments.
      b. Checking adjustments.
      c. Noise and vibration adjustments.
      d. Economy and efficiency adjustments.
   6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. Owner will furnish an instructor to describe Owner's operational philosophy.
   3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00

SECTION 03 10 00 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Forming all flatwork
   2. Forming building pad.

B. Related Sections include the following:
   1. Division 03 Section “Concrete Reinforcement.”
   2. Division 03 Section “Cast-in-Place Concrete.”

1.03 SUBMITTALS

A. Submit diagrams of proposed construction joints not shown on the drawings for approval by the Engineer.

1.04 QUALITY ASSURANCE

A. American Concrete Institute Standard ACI 347, "Recommended Practice for Concrete Formwork".

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms:
   1. Wood forms for unexposed concrete surfaces shall be built of sufficient thickness to sustain the loads to be imposed thereon, dressed to uniformly smooth contact surfaces, and so constructed as to be readily removable.
   2. Wood forms for exposed concrete surfaces shall be constructed of commercial standard Douglas Fir, moisture-resistant, concrete form plywood not less than 5-ply, and at least 9/16" thick, with one smooth face, or shall be forms with linings of one of the following types:

a. Plywood: Commercial standard Douglas Fir, concrete form, exterior 3-ply, not less than 1/4" thick, having one smooth face or,
b. Fiberboard: Treated, hard-pressed box forms, in size indicated on drawings and as manufactured by National Container Corporation or approved equal, and rated to sustain a load exceeding the total weight of fresh concrete placed over the voids.

PART 3 - EXECUTION

3.01 GENERAL

A. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. Adequately shore all concrete members to safely support all loads and lateral pressures outlined in "Recommended Practice for Concrete Formwork" (ACI 347) without distortion, excessive deflection or other damage. Build all necessary forms centering, shores and moulds to conform to the shapes, lines and dimensions of the various members of concrete construction lines, and dimensions of the various members of the concrete construction as shown or scheduled on the drawings. Construct sufficiently tight and so substantially assembled as to prevent bulging or leakage of mortar. Assemble forms to be readily removable without impact, shock or damage to the concrete. Provide temporary openings as required to facilitate cleaning, drainage and inspection. Clean all contact surfaces of lumber once used as forms thoroughly before reuse.

B. Install form ties at proper intervals to securely hold the forms in position during the placing of concrete, and to withstand the weight and pressure of the wet concrete. Coat ties of a type intended to be entirely removed with an approved lubricant to safeguard against damaging the concrete during removal. The use of wire ties will not be permitted.

C. Place and anchor in the forms wood strips, blocking, mouldings, nailers, etc., required to produce the finished profiles and surfaces shown on the drawings and to provide nailing for wood members or other features required to be attached to concrete surfaces in such manner. Coat wood strips, blocking and mouldings with form sealer.

D. Special care shall be given to formwork, ties, bracing, etc. for any concrete surface to be left exposed to permanent view. Waves, bulges, form marks, staining, joint marks or irregularities will not be tolerated and shall be considered unacceptable.

3.02 CONSTRUCTION JOINTS

A. Should construction joints prove to be absolutely unavoidable, locate such joints within the middle third of spans or as detailed on the drawings. Make no additional construction joints under any circumstances without the written approval of the Architect.

B. Provide appropriate keys in all construction joints, whether horizontal or vertical.

3.03 MISCELLANEOUS

A. Construction forms shall be provided for any and all items of concrete work required for or in connection with the satisfactory completion of the project, whether each such item is specifically shown or referred to or not.

3.04 SLABS

A. Form all openings in concrete slabs as required for the vertical passage of ducts, pipes, conduits, etc..

3.05 REMOVAL OF FORMS

A. Do not remove forms until concrete is adequately hardened and set. Clamps or tie rods may be loosened 24 hours after concrete is placed; ties, except for a sufficient number to hold the forms in place, may be removed at that time.

B. Form removal shall be accomplished as a hand operation, with due care to avoid damage to any finished concrete work or any reinforcing passing through forms being removed.

C. Proper cold weather curing procedures shall be observed if concrete forms are removed when the temperature is below 40 degrees F. Refer to recommendations that are set forth in "Recommended Practice for Cold Weather Concreting" (ACI 306).

3.06 CLEANING

A. Upon completion of work of this section, remove related debris from job site.

END OF SECTION 03 10 00

SECTION 03 20 00 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Includes furnishing all materials, equipment, transportation and facilities and performing all labor necessary for the following:
   1. Prepare shop drawings of reinforcing steel.
   2. Furnish and place reinforcing steel.
   3. Fabrication and installation of embedded metal assemblies.

B. Related Sections include the following:
   1. Division 01 "Quality Requirements."
   2. Division 03 "Concrete Formwork."
   3. Division 03 "Cast-in-Place Concrete."

1.03 SUBMITTALS

A. Shop Drawings: Submit shop and installation drawings of reinforcement and embedded metal assemblies for review by the Engineer. Reproduce the bar bending diagram, the beam, slab and joist notes and cast-in-place concrete notes that concern the proper placing of reinforcing and submit it with each set of shop drawings for field use. Use same bar marks on bar bending diagrams as used on the beam, and slab schedule. Use same beam, and wall marks as Contract Documents.

B. Mill Test Reports: Deliver certified copies, evidencing compliance with all requirements of these specifications to the Engineer with all deliveries of reinforcing steel.

C. Submit copies of laboratory inspection reports as follows:
   Steel Supplier - 1 Copy
   General Contractor - 1 Copy
   Owner - 1 Copy
   Architect - 1 Copy
   Structural Engineer - 1 Copy

1.04 LABORATORY TESTING AND INSPECTION

A. Inspect welding of deformed bar anchors at the beginning of each period of production for size, length and quality. Re-inspect corrected welds.

B. Reinforcing: inspect all reinforcing steel prior to placement of concrete for compliance with the Contract Documents and the approved shop drawings. All instances of noncompliance shall be immediately brought to the attention of the Contractor. If uncorrected by the contractor, they shall be listed in the report.
   1. Observe and report the following: number and size of bars; bending; splicing; clearance to forms; clearance between bars; rust, form oil or other contamination; fabrication and installation of embedded metal assemblies, including visual inspection of all welds.

C. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing: All of domestic manufacturers.
   1. Bars: New deformed billet steel, ASTM A-615, grade 60.
   2. Reinforcing bars to be welded: ASTM A706; Bars shall have a carbon content not exceeding 0.30% and a manganese content not exceeding 0.60%. Provide certified copies of the ladle analysis for each lot of bars to be welded.
   3. Welded Wire Fabric: Not Used
   4. Epoxy coated reinforcing bars: ASTM A775.

B. Fiber reinforcing: Not Used

C. Concrete accessories including bar supports, chairs, spacers, etc.: Cold-drawn wire and fabricated in accordance with the requirements of Chapter Seven of the ACI Standard 315 with heights as required.

D. Bar supports for concrete resting on earth: Precast concrete briquettes having tie wires embedded therein, or individual high chairs No. HCP with welded plates on bottom as manufactured by Hohmann & Barnard, Inc. Provide bar supports, hot-dipped galvanized after fabrication, where concrete will be exposed including ceilings of flat slabs.

2.02 METAL ANCHORAGE & CONFINEMENT ASSEMBLIES

A. Steel Shapes and Plates and Rods: Conform to ASTM A36.

B. Welded Deformed Bar Anchors: Welded by full-fusion process; "Nelson" Anchors Type D2L or approved equal.

C. Headed Stud Anchors: Headed Studs welded by full fusion process as furnished by Nelson Stud Welding Company or approved equal.

D. Bolts: Conform to ASTM F1554 with regular hexagon nuts and carbon steel washers.

E. Straps: Conform to ASTM A245 or A284.

F. Welding Electrodes: ASTM Designation A233, Series E70 - AWS 5.5.

G. Dowels: ASTM A-615, grade 60. Size and length as specified on plans. Provide sleeves, supports, and end caps.

2.03 FABRICATION

A. Fabricate reinforcing steel in compliance with the CRSI "Manual of Standard Practice".

B. All bar splices shall be a minimum of Class “A” lap unless specified otherwise on drawings.

C. Shop-fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.

D. Deliver all reinforcement to the project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

E. Reinforcing with any of the following defects will not be permitted in the work: Bar lengths, depths, and bends exceeding the specified fabrication tolerances, bends or kinks not indicated on drawings or final shop drawings, bars with reduced cross-section due to excessive rusting or other cause.

2.04 COATING

A. Rust inhibitor for field application to metal accessories shall be Hi-Build Epoxoline manufactured by the TNEMEC Co., Kansas City, Missouri or approved equal.

B. Hot dip galvanizing shall conform to ASTM A123.

C. Cold Galvanizing Compound for field repair of galvanizing shall be “ZRC Cold Galvanizing Compound” by ZRC Chemical Products Company, Quincy, Massachusetts, or approved equal.

PART 3 - EXECUTION

3.01 MATERIAL STORAGE

A. Stack reinforcing steel in tiers. Exercise care to maintain all reinforcement free of dirt, mud, paint, rust, etc.

3.02 GENERAL

A. Place reinforcing steel of the sizes, shapes, lengths, spacing and other dimensions where shown on the drawings. Details of reinforcing shall conform to the ACI Building Code Requirements for Structural Concrete (ACI 318-99).

3.03 MARKING

A. Mark bars plainly. Limit bundles to 1 size and 1 length and tag each bundle with metal tags.

3.04 CLEANING

A. Clean reinforcement thoroughly of rust, mill scale, dirt, oil or other coatings which might tend to reduce the bonding to the concrete.

3.05 BENDING

A. Bend bars cold. Heating of reinforcement, or handling by makeshift methods, will not be permitted and bars having kinks or bends not required will be rejected.

3.06 PLACING

A. Comply with the specified codes and standards, and the Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Place reinforcement accurately, securely saddle tie at every other intersection with No. 18 gauge black annealed wire, and rigidly hold in place during the placing of the concrete by means of metal chairs or spacers.

C. Hold bars in position and to proper clearance of concrete surface by spacers, chairs, or other necessary supports with the following tolerances:
   1. Top bars in slabs and beams:
      a. Members 8" deep or less: $\pm$ 3/8"
      b. Members more than 8" but not over 2' deep: $\pm$ 1/2"
      c. Members more than 2': $\pm$ 3/4"

2. Lengthwise of members: ± 2"
3. Concrete cover to formed surfaces: ± 1/4"
4. Minimum spacing between bars: ± 1/4"

3.07 CONCRETE PROTECTION

A. Minimum protection for reinforcing steel shall be as follows:
   1. Grade beams and exterior face of walls and columns exposed to the weather or in contact with the ground: 2".
   2. Reinforcing in structural elements deposited against soil: 3".
   3. Beam formed with fiberboard void boxes: 2".
   4. Slabs: 1.5".

3.08 EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Welded construction shall conform to the AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings and AWS D1.1. Welding shall be done by AWS certified welders.

B. Welding of deformed bar anchors and headed stud anchors shall be done by full-fusion process equal to that of Nelson Stud Welding Company.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Concrete for building slab and grade beams.
   2. Concrete for flat work.

B. Related Sections include the following:
   1. Division 03 Section "Concrete Formwork."
   2. Division 03 Section "Concrete Reinforcment."
   3. Division 07 Section "Vapor Barrier Membrane."
   4. Division 09 Section "Painting."
   5. Division 32 Section "Concrete Paving."

1.03 DESCRIPTION

A. Work Included: Furnish all materials, equipment, transportation and facilities, and perform all labor necessary for the following:
   1. Furnish and place cast-in-place concrete.
   2. Grouting structural steel.
   3. Finishing and curing of concrete.
   4. Concrete Mix Designs.
   5. Laboratory testing of concrete.

B. All concrete shall be ready-mixed or transit-mixed, obtained from a plant, the operations of which shall conform to requirements of ASTM C94. Job-mixed concrete shall not be used, except where particularly authorized by the Owner in small quantities such as may be needed to affect patching and repairs.

1.04 REFERENCES

A. The latest adopted edition of all standards referenced in this specification section shall apply, unless noted otherwise.

1.05 SUBMITTALS

A. Submit proposed mix designs prepared in accordance with ACI 301, Chapter 3.9. Each proposed mix design shall be accompanied by a complete standard deviation analysis based on at least 30 consecutive strength tests, or by three laboratory trial mixtures with the confirmation tests.

B. Failure by the contractor to submit the shop drawings, test reports and/or mix designs required above shall release the architect and the engineer from any liabilities due to the negligence on the part of the contractor to comply with the construction documents.

1.06 CONCRETE MIX DESIGNS

A. Selection of proportions: Proportions of ingredients for concrete mixes shall be determined and/or certified by an independent testing laboratory in accordance with the requirements of Chapter 5 of the ACI Standard "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE: (ACI 318-08), to provide characteristics listed on the drawings for each class of concrete.

1. General: Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, water, and as specified, an air-entraining admixture. Proportions of ingredients shall produce a mixture which will work readily into corners and angles of forms, bond to reinforcement, without segregation or excessive bleed water forming on the surface. Water-reducing admixture or high range water-reducing admixture (super plasticizer) may be used at contractor's option if properly designed into concrete mix. Use air-entraining admixture in all concrete except piers. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within 2% to 4%. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
   a. Ramps and Sloping Surfaces: Not more than 3".
   b. Reinforced Foundations Systems: 4" plus or minus 1".
   c. Piers: 5" min and 7"max.
   d. Other Concrete: 4" plus or minus 1".

2. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as herein specified. Addition of water to the batch will not be permitted. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C 94 may be required. When air temperature is between 85° F. (30° C.) and 90° F. (32° C.), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90° F. (32° C.), reduce mixing and delivery time to 60 minutes.
3. Required Average Strength Above Specified Strength: Determinations of required average strength above specified strength shall be based on the standard deviation record of the production facility in accordance with ACI 301. Calculation of standard deviation of compressive strength results shall be in accordance with ACI 214, "Recommended Practice for Evaluation of Comprehensive Test Results of Field Concrete."

4. If a suitable record of past performance is not available, proportions shall be selected on the basis of laboratory trial batches to produce an average strength greater than the specified strength f'c by the amount defined in ACI 301, Table 3.9.2.2.
5. All concrete mix designs shall include the following information:
    a. Proportions of cement, fine and course aggregates and water.
    b. Water-cement ratio, design strength, slump and air content.
    c. Type of cement and aggregates.
    d. Type and dosage of all admixtures.
    e. Special requirements for pumping.
    f. Range of ambient temperature and humidity for which the design is valid.
6. If a testing laboratory provides concrete mix designs, it shall be selected by the Contractor, approved by the Architect and paid for by the Contractor.

1.07 LABORATORY TESTING AND INSPECTION

A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Architect for final acceptance.

B. Testing agencies shall meet the requirements of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction" ASTM E 329.

C. The following testing services shall be performed by the testing laboratory:
1. Secure concrete samples in accordance with "Method of Sampling Fresh Concrete" ASTM C172.
2. Mold and cure four specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexural Specimens in the Field" ASTM C31. The cylinders shall be stored in the field for 24 hours and then transported to the laboratory to be cured.
3. Test specimens in accordance with "Method for Test for Compressive Strength of Molded Concrete Cylinders" ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. One specimen shall be held for future testing, if required.
4. Make one strength test (four cylinders) for each 100 cu. yd. or fraction thereof, of each mix design of concrete placed in any one day.
5. Determine total air content of air entrained normal weight concrete for each strength test in accordance with ACI 231.
6. Report test results in writing to the Architect and Structural Engineer on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of contractor, name of concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day test and 28-day tests, and air content.

7. Determine slump for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete" ASTM C143.
8. Determine temperature of concrete sample for each strength test.

D. 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. Test to determine adequacy of concrete will be by cored cylinders complying with ASTM C42. Contractor shall pay for such test conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

E. Monitor the addition of water at the jobsite and the length of time concrete is allowed to remain in the truck before placement.

F. Testing non-shrink grout: Make one strength test for every 10 baseplates grouted.

G. The Contractor shall provide and pay for the necessary testing services of the following:
1. Qualification of proposed materials and the establishment of mix designs in accordance with "Building Code Requirements for Structural Concrete" ACI 318.
2. Other testing services needed or required by the Contractor.

H. To facilitate testing and inspection, the contractor shall:
1. Furnish necessary labor to assist testing agency in obtaining and handling samples at the job site.
2. Advise the testing agency in advance of operations to allow for the assignment of testing personnel and testing.
3. Provide and maintain for the use of the testing agency adequate facilities for proper curing of concrete test specimens on the project site in accordance with "Methods of Making and Curing Concrete Compression and Flexural Specimens in the Field" ASTM C31.

I. Evaluation and acceptance:
1. The strength level of the concrete will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result (average of two cylinders) is below specified strength by more than 500 psi.
2. Completed concrete work will be accepted when the requirements of "Specifications for Structural Concrete for Buildings" ACI 301, Chapter 18 have been complied with.
3. In any case, where the average strength of the laboratory control cylinders, as shown by the tests for any portion of the structure, falls below the minimum specified ultimate compressive strength, the Architect shall have the right to require the Contractor to provide improved curing conditions of temperature and moisture to secure the required strength. Also, if the average strength of the laboratory control cylinder should fall so low as to cause the portions of

the structure to which the respective unsatisfactory test reports apply to be in question by the Architect, the Contractor shall follow the core procedure set forth in the current edition of ASTM C42. If the results of the core tests indicate, in the opinion of the Architect, that the strength of the structure is inadequate, such replacement, load testing, or strengthening as may be ordered by the Architect shall be provided by the Contractor without cost to the Owner.

J. Reports: The testing laboratory shall make reports to the following:
   a. Concrete supplier - 1 copy
   b. Contractor - 1 copy
   c. Owner - 1 copy
   d. Architect - 1 copy
   e. Structural Engineer - 1 copy
   2. Reports shall be made and distributed immediately after the respective tests or inspections are made.
   3. Where reports indicate deviations from the Contract Documents, they shall also include a determination of the probable cause of the deviation and where applicable, a recommendation for corrective action.
   4. Wherever the testing laboratory recognizes a trend of decreasing quality in the concrete due to changing reasons, conditions of curing or other cause; this shall be brought to the attention of the Architect, along with a recommendation for corrective action to be taken before the materials fall below the requirements of these Specifications.

K. Authority & Responsibilities of the Testing Laboratory
   1. The laboratory representative shall immediately notify the Architect and the Contractor of any deviance from Specifications and approved design mixes observed at the mixing plant or the job site.
   2. If, in the opinion of the laboratory representative, the deviance observed will be probable cause for subsequent rejection of the material, he shall so inform the Contractor and Architect so that a timely decision as to whether or not to continue operations can be made.
   3. Subsequent to on-the-spot verbal notification, the laboratory shall file a written report of any deficiencies or deviance noted including a summary of conversations and decisions made and action taken at the time in accordance with Paragraph 1.
   4. The testing laboratory shall control field adjustments made to concrete mixes to compensate for field conditions and report same in accordance with Paragraph H.

1.08 QUALITY ASSURANCE

A. Materials and work shall conform to the requirements of all standards, code, and recommended practices required in Contract Documents. In conflicts between a standard and the contract Documents, the Contract Documents shall govern. In the

case of a conflict between the Contract Documents and the local building code, the more stringent requirement shall govern.

1. Applicable Standards:
    a. "Specifications for Structural Concrete for Buildings" ACI 301-05.
    b. "Building Code Requirement for Structural Concrete" ACI 318-08.
    c. "Standard Specifications for Ready-Mixed Concrete" ASTM C94.

PART 2 - PRODUCTS

2.01 MATERIALS FOR STRUCTURAL CONCRETE

A. Portland Cement shall conform to ASTM C150, Type I, domestic manufacturer. Only one (1) brand of cement shall be used throughout the work.

B. Fine aggregate shall conform to the applicable requirements of the current edition of ASTM C33, and shall be natural bank or river sand, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, and shall be so graded from coarse to fine as to produce a minimum percentage of voids.

C. Coarse aggregate shall conform to the current edition of ASTM C33, shall be gravel or crushed stone suitably processed, washed and screened, and shall consist of hard, durable particles without adherent coatings. Maximum aggregate size shall be size no. 467 for piers, size no. 67 for all other concrete.

D. Concrete Admixtures: Provide admixtures produced and serviced by established, reputable manufacturer and used in compliance with manufacturer's recommendations.
    1. Air-entraining agent, conforming to ASTM C260, and CRD C-13, "MB-VR" by Master Builders or approved equal.
        a. When requested, certification attesting to the percentage of effective solids and compliance with ASTM C260 shall be furnished.
    2. Water-reducing, set-controlling admixture, conforming to ASTM C494, Type A (water-reducing).
        a. Field Service: When requested, a qualified concrete technician employed by the manufacturer shall be available to assist in proportioning concrete materials for optimum use, to advise on proper use of the admixture and adjustment of concrete mix proportions to meet job-site and climatic conditions.
        b. Obtain approval of the Architect, in writing, before using set-controlling admixtures.
    3. Calcium chloride and admixtures containing more than 0.05 percent chloride ions will not be permitted in the concrete mixtures.
    4. Fly Ash will be allowed for up to 20% by volume as a partial substitute for cement, where ambient tempartures at the time of pour are expected to be in excess of 70 degress farenheit.

E. Water shall be city water.

F. Fibrous Reinforcement: Not Used

2.02 CURING MATERIALS

A. Wet Cure Blanket: Waterproof covering, for curing exposed finish concrete floors, shall be non-staining, reinforced with fibers, and conforming to the requirements of the current edition of ASTM C171-03, ASTM C171-97a, and AASHTO M171-00, standard specifications for sheet material for curing concrete slabs. McTech Group, Inc.; "UltraCure NCF", Loganville, GA (866) 913-8363, or comparable product by another Manufacturer.

B. Curing Compounds:
   1. For Slabs not scheduled for Chemical Hardener: Clear Bond as made by Guardian Chemical Co., Acri-Seal as made by Toch Bros., Dress and Seal as made by L & M Construction Chemicals, MasterKure as made by Sonneborn, or Res-X Cure by Burke Concrete Accessories.
   2. For Slabs to be Chemically Hardened: Do not use film-forming curing compounds. Where curing compound is required, a non-film-forming curing compound chemically compatible with the hardener may be used, if first approved by the chemical hardener Manufacturer Dissipating liquid membrane-forming compounds for curing concrete; Conform to ASTM C309, Type 1. Curing compound shall be compatible with floor sealer or finish used. Low VOC.
      a. Euclid: VOX Kurex DR series; waterborne products.
      b. W.R. Meadows: 1100 series.
      c. L&M Construction Chemicals: Cure R.

C. Evaporation retarder: "MasterKure ER 50" by BASF or equal; spray applied liquid film for hot weather finishing.
   1. Do not use evaporation retarder at slabs to be densified, unless specifically approved for compatibility by the densifier manufacturer.

D. Water: Potable.

2.03 FINISHING MATERIALS

A. Cement Floor Leveling Compound: Drytek Flooring Solution's "Drytek 7800 Fiber Reinforced Leveling Compound" (Liquid Felt up to 1/8" over 1/8" mix with Portland Cement and Sand), as distributed by the Drytek Flooring Solutions, (603) 334-3440, www.drytek.com or approved equal. Floor leveling compound may only be used where floor will not be exposed.

B. Abrasive Aggregate for Non-slip Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide. Use material that is factory graded, packaged, rust-proof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

C. Floor Sealing Compound: "Master Seal 330" by Master Builders, Cleveland, Ohio or approved equal..

D. Evaporation retarder: "Confilm" by Master Builders; spray applied liquid film for hot weather finishing.

2.04 MISCELLANEOUS MATERIALS

A. Expansion Joint Material: Preformed expansion joint material conforming to ASTM D-1751.

B. Drilled Anchor Bolts: Shall be "Titen HD" bolts manufactured by Simpson Strongtie, or approved equal.

C. Rust Inhibitor: For field application to metal accessories shall be "Hi-Build" Epoxoline manufactured by Tnemec Co., Inc., Kansas City, Missouri or approved equal.

D. Accessories: AC315 Galvanized chairs, stools, spacers, etc. shall be by Superior Manufacturing Co., or equal.

2.05 NON-SHRINK GROUT

A. Shall be pre-mixed, non-shrinking, non-metallic, high strength grout. Compressive strength in 7 days shall be 5000 psi minimum, and 7000 psi minimum at 28 days. Manufacturer shall provide evidence that the material meets the criteria of the Corps of Engineers Specification No. CRD-C 621-82B and ASTM C1107. Grout shall be non-oxidizing.
   1. Manufacturers:
      a. Master Builders Co. Masterflow 713
      b. Euclid Chemical Company: NS Grout

2.06 EPOXY (FOR PATCHING)

A. Shall be a two-component polymer modified cementitious system equal to "SikaTop" series as manufactured by Sika Chemical Corp., Lyndhurst, New Jersey or approved equal. SikaTop product selected shall be appropriate for intended repair and shall be approved by Architect.

2.07 ANCHORING CEMENT (FOR GROUTING ANCHOR BOLTS AND DOWELS)

A. "Super Por-Rok" Exterior Anchoring Cement by CGM, Inc. or approved equal.

2.08 SAND-CEMENT GROUT

A. Shall be a mixture of one part Type I Portland Cement and 2 1/2 parts clean, natural sand conforming to ASTM C33. Water content shall be 5-1/2 gallon per sack of cement, maximum.

PART 3 - EXECUTION

3.01 PRODUCTION OF CONCRETE

A. Concrete shall not be mixed for placing in the work until mix designs and corresponding strength tests have been submitted and accepted by the Architect.

B. Mixing: Transit-mixed concrete conforming to the requirements of ASTM C94 shall be used in lieu of concrete mixed at the job site. Concrete shall not be transported or used in any case after a period in excess of 90 minutes has elapsed after the introduction of water into the mixer. The transit-mixed concrete supplier shall have a plant of sufficient capacity, and adequate transportation facilities, to assure continuous delivery at the rate required. The frequency of deliveries to the site of the work must be such as to provide for placing the concrete continuously throughout any one pour.

C. When approved by the laboratory inspector, water may be added to the truck at the jobsite to adjust the slump, but the water content shall not exceed the maximum specified water/cement ratio for the mix.

3.02 PLACING CONCRETE

A. Preparation:
   1. Equipment for chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to assure a practically continuous flow of concrete at the delivery end without separation of the materials, and all of the details thereof shall be submitted to the Architect for approval in advance of the use of such equipment. The use of aluminum chutes or conveyors for transporting concrete horizontally will not be permitted.
   2. Inserts: Give the various trades and subcontractors ample notification and opportunity to install anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frames, vents, wires, supports, or other items required to be built into the concrete by the provisions of the Drawings or of the Specifications governing the work of such trades and subcontractors, or as may be necessary for the proper execution of their work.
   3. Contractor shall provide access for delivery and provide sufficient equipment and manpower to rapidly place all concrete.

a. All work shall be in accordance with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
b. Formwork shall have been completed; snow, ice, water and debris removed from within forms.
c. Expansion joint material, anchors and all embedded items shall have been positioned.
d. Concrete shall not be placed on frozen ground or metal deck.

4. Anchor Bolts: Use templates to set anchor bolts and secure into position before placing the concrete. Do not stab anchor bolts into the concrete.
5. Pump priming grout shall be discarded and not used in the structure.

B. Conveying Concrete:
1. Convey concrete from the mixer to the place of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete to be conveyed by pumping will require acceptance by the Engineer for each class of concrete specified before being used.

C. Depositing Concrete:
1. General: Place concrete in reasonably uniform layers, approximately horizontal, and not more than twelve inches (12") deep, exercising care to avoid vertical joints or inclined planes. The piling up of concrete in the forms, in such manner as to cause the separation or loss of any of its ingredients, will not be permitted. Concrete which has partially set or hardened shall not, under any circumstances be deposited in the work. Place concrete in the forms as nearly in its final position as is practical to avoid re-handling.
a. Exercise special care to prevent splashing the forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on the forms or reinforcement before the work proceeds.
b. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the respective member or section, except as hereinafter specified.
c. Do not permit concrete to drop freely any distance greater than three feet (3'). Where longer drops are necessary, use a chute or tremie to assist the concrete into place without separation.
d. Do not place concrete into any excavations where water is standing.

2. Slump: Concrete shall not be placed when its plasticity, as measured by slump tests, is outside the limits indicated in these specifications.
3. Vibration: As soon as concrete is deposited, vibrate concrete by means of mechanical vibrators, so manipulated as to work the mixture into all parts and corners of the forms, and around the reinforcement and inserts. Mechanical vibrators shall have a minimum frequency of 6000 impulses per minute and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of

vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix. A spare vibrator shall be kept on the job site during all concrete placing operations.

4. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, the surfaces of the latter shall be thoroughly roughened and cleaned of all foreign matter, scum, etc.. The forms shall be tightened and the surface of the previously deposited concrete shall be slushed with grout, of materials and mix identical to those of the concrete to be placed, except the coarse aggregate shall be omitted. From one inch (1") to two inches (2") of grout shall be applied, as directed by the Architects, depending upon conditions of the respective case. The new concrete shall be deposited before the grout attains its initial set, and the work shall be performed in such a manner as to assure complete bonding of the newly poured concrete to that previously placed.
5. Construction Joints: Except as otherwise specifically indicated on the Drawings, each pier, beam, and slab shall be considered as a single unit, and all concrete shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, they shall be located at or near the midpoints of spans. Joints shall be prepared and primed per the manufacturer's recommendation. Additional construction joints shall not be made under any circumstances without the written approval of the Architects.
6. Slabs:
    a. Pour the slabs with proper offsets, slopes to drains, etc., as shown or noted, and finish as specified in Article 3.05.
    b. Grade and properly recompact the surface of the subgrade under all concrete slabs shown to be placed on fill. All work required to be installed under the slabs on fill shall be completed and approved before any concrete is poured.

D. Weather Conditions:
1. Cold Weather: Temperature of concrete delivered at the job-site shall conform to the following minimum:

Air Temperature	Concrete Temperature
30° to 45° F.	55° F. to 90° F.
0° to 30° F.	60° F. to 90° F.
Below 0° F.	65° F. to 90° F.

    a. Water heated to above 100° F. shall be combined with the aggregates before cement is added. Cement shall not be added to water or aggregates having a temperature greater than 100° F.
    b. All work shall be in accordance with ACI 306, "Recommended Practice for Cold Weather Concreting."
    c. When the outdoor temperature is less than 40° F. temperature of the concrete shall be maintained at not less than 50° F. for the required curing time.
    d. Arrangements shall be made before placement to maintain required temperature without injury from excessive heat.

e. Combustion heaters shall not be used during the first 48 hours without precautions to prevent exposure of concrete and workmen to exhaust gases containing carbon dioxide and carbon monoxide.

2. Hot Weather; Temperature of concrete delivered at the job-site shall not exceed 90° F. Ingredients shall be cooled before mixing to prevent concrete temperature in excess of 90° F.
   a. All work shall be in accordance with ACI 305, "Recommended Practice for Hot Weather Concreting."
   b. Provisions shall be made for windbreaks, shading, fog spraying, sprinkling or wet cover when necessary.
   c. Use the specified evaporation retarder to prevent rapid drying of the surface during finishing.

3.03 INSTALLATION OF NON-SHRINK GROUT (UNDER BASE PLATES)

A. Preparatory Work: Clean slab or foundation with liberal amounts of water. Remove all oil, grease and paint from areas of base plates or foundations to be grouted. Remove all waste materials, dirt, chips, oil and excess water from anchor bolts, slabs or foundations. Have all necessary tools and materials as near area to be grouted as possible to permit rapid and continuous work with grout. Anchor all forms securely to prevent movement during placing or curing if grout is to be used in flowable state.

B. Mixing: A mechanical mixer should be used. Add only enough water to make placeable. Avoid an excess of water. Do not mix more grout than can be placed within 20 minutes. Under no circumstances should grout be retempered.

C. Grout Temperatures: Grout temperatures should be maintained at 45° - 75° F. When conditions dictate, these temperatures can be achieved by the use of cool mixing water or heated mixing water. Care should be exercised so that extremes of hot or cold are not used. Maintain temperature for 24 hours. Thereafter, maintain temperature above 40° F (4° C) until grout has achieved a 5000 psi strength.

D. Placing: As grouting procedure begins, placement and compaction should be continuous until completed. Lengths of chain (up to 1" link) placed in forms before placing grout will assist in compacting the grout and eliminating air pockets. Chains or straps should be worked in quick, short strokes and removed before initial set occurs. Grout should be placed from one end or side only to avoid excessive air entrapment and assure good compaction. Do not overwork grout as this causes segregation, bleeding and breakdown of initial set. If machines or equipment are being used nearby, consider shutting them down until grout takes final set. Grout may be fluid.

3.04 FINISHING CONCRETE SLAB SURFACES

A. General: Concrete slabs shall be finished as hereinafter described. The dusting of wearing surfaces with dry materials will NOT be permitted.

B. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations.

C. Screeding: slab shall be struck off true by double screeding to the required level at or below the elevation or grade of the finished slabs as indicated on the Drawings.

D. Floating: Immediately after screeding, before any excess bleed water is present on the surface, float the surface using long-handled bull floats or darbies.

E. Float Finish:
   1. Locations: All concrete surfaces under mud-set tile or pavers.
   2. Finishing: After concrete has stiffened sufficiently and bleed water has evaporated, the surface shall be wood floated to produce a uniform texture with no coarse aggregate visible. Apply sufficient pressure to bring the moisture to the surface.

F. Trowel Finish:
   1. Locations: All concrete surfaces under:
      a. Thin set tile
      b. Carpets
      c. Vinyl floor tile
      d. Exposed concrete
      e. Typical unless noted otherwise
   2. Trowelling: Steel trowel not less than two passes. Begin troweling with power trowel as soon as little or no cement sticks to the blades. Dusting with dry cement or aggregate to stiffen mix or absorb moisture is not allowed. The concrete shall then be hand troweled or machine troweled to produce a smooth impervious surface for the purpose of burnishing.

G. Broom Finish:
   1. Locations: Exterior stairs, ramps, walks and other locations where noted on the drawings.
   2. Finishing: Same method as specified for trowel finish, except after initial troweling brush concrete surfaces with a soft brush or broom to texture as specified by the architect.

H. Power Machine Finishing: In place of hand finishing, the Contractor may use a power machine approved by the Architect for finishing the concrete surfaces for finishing the concrete surfaces. However, the preparation of concrete surfaces for finishing by machine shall be, in general, as hereinbefore required for hand finishing.

I. Non-slip Finish: Apply abrasive aggregate at the rate of 25 lbs. per 100 SF per manufacturer's instructions in areas specified.

3.05 FINISHING EXPOSED CONCRETE SURFACES (OTHER THAN SLABS)

A. General: It is the intent of these Specifications to provide for exposed concrete surfaces of such quality as to require a minimum of pointing. Such care shall be exercised in the forming, mixing and place of the concrete as to assure reasonable uniform dense surfaces, free from blemishes or defects. However, in the event of unsightly voids, honeycombs, etc., they shall be repaired as soon as possible. Loose particles shall be removed from honeycombed spots, and fins and other projections shall be neatly dressed off. Holes shall be drenched with clean water and properly patched with Portland Cement and sand mortar. Large surface swirls or heavily textured surfaces are not acceptable.

B. Exposed Vertical Surfaces: Following removal of forms, fill bolt and tie rod holes with concrete made with same mix as poured concrete, except large aggregate shall be removed. Fill holes passing through concrete members from inside face. Stone rub to uniform sand finish, unless otherwise noted in drawings.

C. Patching and Repairs: Remove honeycomb voids, cracks, and irregularities. Where repair is required, cut back defects not less than 1/2" with square edges, brush out, drench with water and fill with concrete of same mix from which coarse aggregate is removed. When cut-outs have been filled, trowel surface smooth, remove excess grout and after set, grind slightly to uniform color and appearance using neat Portland Cement applied with a power grinder wheel.

3.06 FILLING TIE ROD AND BOLT HOLES

A. Holes resulting from the removal of bolts or tie rods shall be solidly filled with cement grout. All excess mortar at the faces of filled holes shall be struck off flush, with a canvas sack.

3.07 CURING AND PROTECTION

A. Protect all freshly placed concrete from washing by rain, flowing water, etc. Do not allow concrete to dry out from the time it is deposited in the forms until the expiration of the curing period hereinafter specified. The methods of curing shall be as specified in the following paragraphs, unless otherwise authorized by the Architects.

B. Concrete surfaces, not otherwise specified, shall be cured by being kept wet with clean water for a period of not less than seven (7) days after placing. Each day the forms are left in place, and kept wet enough to prevent the opening of joints in the forms and the drying out of the concrete, will be counted as one (1) day of curing.

C. In lieu of the wetting specified above, the Contractor may use a non-bituminous liquid sealing and curing compound to seal the moisture in the concrete. Such material shall not, however, be applied to surfaces which are to receive further concrete, mortar, resilient tile or liquid vinyl coating. Curing liquid, if used, shall be

applied in conformity with the recommendations of the manufacturer of the material approved for use, and to sufficient extent to effectively hold the moisture in the concrete. The use of such material shall not relieve the Contractor of the responsibility of protecting all floor slabs, platforms, and steps whenever any scaffolding, shoring, form work, masonry, concrete or other work is being done over or above finished concrete slabs.

D. Permanently exposed concrete floors shall be cured by covering the entire surface, as soon as practical after finishing, with waterproof paper, laid with four-inch (4") lapped joints. The joints shall be covered with gummed tape or be glued with waterproof glue. Such covering shall remain in place until completion of the building, except on surfaces where ceramic tile is to be applied, in which cases the covering shall be removed after a period of seven (7) days has elapsed after the placing and finishing of the concrete. Tears in paper shall be repaired.

E. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense, and in conformity with all of the requirements of the Drawings and Specifications. Removal and replacement of concrete work shall be done in such manner as not to impair the appearance or strength of the structure in any way.

F. Cleaning: Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in a clean condition, satisfactory to the Owner. After sweeping with an ordinary broom and removing all mortar, concrete droppings, loose dirt, mud, etc., wash all concrete floors and platforms with soapsuds and scrub with a stiff fiber brush. Mop up the suds and flush the surfaces with clean water. Provide adequate measures during scrubbing, mopping, and flushing operations to keep excessive or injurious amounts of water off resilient tile floors. Any damage to such floors shall be promptly, effectively and satisfactorily repaired.

3.08 INSTALLATION OF SEALER

A. Apply liquid sealer in accordance with manufacturer’s instructions on all floor surfaces to remain exposed but that will not receive architectural finishes. Apply hardener at the rate of one gallon per 300 square feet of floor area. Do not apply sealer on surfaces where curing compound has been used. Sealer shall not be applied until concrete has been cured for 28 days.

END OF SECTION 03 30 00

SECTION 03 45 00 - ARCHITECTURAL PRECAST CONCRETE

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 the following:
   1. Architectural precast concrete cladding units.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete"
   2. Division 4 Section "Manufactured Stone Masonry"

1.03 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
   1. Loads: As indicated in Structural Drawings.
   2. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:
      a. Upward and downward movement of 1 inch.
   3. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
   1. Indicate separate face and backup mixture locations and thicknesses.
   2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
   3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
   4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
   5. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
   6. Indicate relationship of architectural precast concrete units to adjacent materials.
   7. Indicate locations and details of stone facings, anchors, and joint widths.

D. Samples For Initial Selection: Provide samples demonstrating manufacturer's full range of finish, color, and texture variations.

E. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, approximately 12 by 12 by 2 inches.

F. Welding certificates.

G. Qualification Data: For Installer, fabricator, and testing agency.

H. Material Test Reports: For aggregates.

I. Material Certificates: For the following items, signed by manufacturers:
   1. Cementitious materials.
   2. Reinforcing materials and prestressing tendons.
   3. Admixtures.
   4. Bearing pads.
   5. Structural-steel shapes and hollow structural sections.

J. Source quality-control test reports.

K. Field quality-control test and special inspection reports.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 2 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
   1. Locate panels where indicated or, if not indicated, as directed by Architect.
   2. Demolish and remove sample panels when directed.

F. Mockups: After sample panel and range sample approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup including manufactured stone veneer, stucco, aluminum framing, glass, sealants, and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
   2. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

F. Lift and support units only at designated points shown on Shop Drawings.

1.08 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.01 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized.

D. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60, deformed bars, assembled with clips.

E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

F. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

G. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
   1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:
   1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
   2. Metakaolin Admixture: ASTM C 618, Class N.
   3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
   4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
   1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
      a. Gradation: To match design reference sample.
   2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
   1. Water-Reducing Admixtures: 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. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
   5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017 M.

2.03 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283.

D. Malleable Iron Castings: ASTM A 47.

E. Carbon-Steel Castings: ASTM A 27, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123 or ASTM A 153 electrodeposition according to ASTM B 633, SC 3, Types 1 and 2.
   1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.

2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

N. Welding Electrodes: Comply with AWS standards.

2.04 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
1. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

C. Stainless-Steel-Headed Studs: ASTM A 276, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.05 ACCESSORIES

A. Reglets: Specified in Division 7 Section "Sheet Metal Flashing and Trim."

B. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.06 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.
1. Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
1. Compressive Strength (28 Days): 5000 psi minimum.

2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.08 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
   1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
   2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
   3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
   4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
   5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

G. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

1. Delay detensioning or post-tensioning of precast, prestressed architectural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.

H. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

L. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

M. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.09 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.10 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and as follows:
1. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.

2. As-Cast Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs.
3. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed top and bottom surfaces of architectural precast concrete units to match face-surface finish.

C. Finish exposed top and bottom surfaces of architectural precast concrete units by smooth, steel-trowel finish.

D. Finish unexposed surfaces of architectural precast concrete units by float finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.02 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil-thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
4. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
5. Remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
   1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.03 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Erect architectural precast concrete units level, plumb, square, and true, without exceeding the following noncumulative erection tolerances:
   1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
   2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
   3. Top Elevation from Nominal Top Elevation: As follows:
      a. Exposed Individual Panel: Plus or minus 1/4 inch.
      b. Non-Exposed Individual Panel: Plus or minus 1/2 inch.
      c. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
      d. Non-Exposed Panel Relative to Adjacent Panel: 1/2 inch.
   4. Support Elevation from Nominal Support Elevation: As follows:
      a. Maximum Low: 1/2 inch.
      b. Maximum High: 1/4 inch.
   5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet: 1 inch.
   6. Plumb in Any 10 Feet of Element Height: 1/4 inch.
   7. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
   8. Joint Width (Governs over Joint Taper): Plus or minus 1/4 inch.
   9. Maximum Joint Taper: 3/8 inch.
   10. Joint Taper in 10 Feet: 1/4 inch.
   11. Maximum Jog in Alignment of Matching Faces: 1/4 inch.
   12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.
   13. Opening Height between Spandrels: Plus or minus 1/4 inch.

3.04 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.05 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
   1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. This specification covers all labor, materials and services incidental to and including the furnishing and setting of all Cast Stone as indicated on the drawings and specified herein.
   2. The Manufacturer shall be responsible for all labor, materials, equipment and services necessary for an incidental to providing all Cast Stone covered by this Specification.
   3. The Setting Contractor shall unload, receipt for, protect, store and set all Cast Stone covered by this Specification and shall provide and install all anchors for same.

B. Related Sections:
   1. Division 06 Section - Rough Carpentry, for wood blocking supporting cast stone.
   2. Division 06 Section - Wood Framing, for wood stud frames supporting cast stone.
   3. Division 06 Section - Sheathing
   4. Division 07 Section - Plastic Film Air Barrier, for membranes applied to exterior face of exterior sheathing at exterior walls.
   5. Division 07 Section - Joint Sealants, for sealing control and expansion joints in unit masonry.
   6. Division 07 Section - Thermal Insulation, for cavity wall insulation.
   7. Division 09 Section - Stucco

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
   1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: Submit manufacturer's full range of color options.

D. Samples for Verification:
   1. For each color and texture of cast stone required, 10 inches square in size.

1.04 QUALITY ASSURANCE

A. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. All Engineered Cast Stone Panels shall be carefully loaded and packed for transportation exercising customary and reasonable precautions against damage while in transit. All products shall be released to freight carrier in a sound, unblemished and unbroken condition.

B. All Engineered Cast Stone Panels shall be received and unloaded at the project site by competent workmen with the necessary care and handling to avoid damage and soiling to Engineered Cast Stone Panels.

C. Engineered Cast Stone Panels shall be stored on the job site in the same crating and packaging used for shipment. The packages and/or crates shall be stored on a level area clear of the ground and protected from the weather and other trades. If pieces are to be stored after uncrating, they should be placed carefully on edge and secured on non-staining supports. Pieces shall be stacked a maximum of one row high and protected from the weather and damage.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. All Engineered Cast Stone Panels used in this work shall be manufactured by Pineapple Grove Designs, Palm Beach County, FL 33425, (800) 771-4595, and shall meet the specifications as indicated in the manufacturer's Technical Data sheets.

2.02 CAST STONE PANELS

A. All Engineered Cast Stone Panels shall be a matrix of proprietary ingredients including cement, crushed and graded stone, AR glass fiber, iron oxide pigment and admixtures necessary to achieve required physical properties. Non-metallic reinforcement material will be incorporated in each panel as required for additional structural properties. Ingredients Include:
   1. Cement: Type 1 White meeting ASTM C150.
   2. Aggregate: Graded and washed natural sands and crushed graded stone meeting ASTM C33, except that gradation may vary to achieve desired finish and texture; ± 20% Post Consumer Glass and Aggregate.
   3. Fiber: Alkaline resistant AR glass fibers.
   4. Coloring: Inorganic synthetic iron oxide pigments meeting ASTM C979 dispersed integrally throughout the mix.
   5. Admixtures: Proprietary list of ingredients necessary to achieve required air entrainment, low permeability, accelerated cure, increased flexural and compressive strength and freeze-thaw resistance.

2.03 RELATED MATERIALS

A. Mechanical Fasteners (Lugs): 1/4'' x 20 female stainless steel threaded embed anchors shall be cast in the rear of the Engineered Cast Stone Panel by Pineapple Grove Designs. Manufacturer shall also provide 1/4'' x 20 stainless steel studs to be threaded into each anchor at job site. Studs shall project from rear of Engineered Cast Stone Panel a minimum of 1'' for insertion into hole drilled in the structural substrate of the mounting wall. Number of anchors provided will vary by size of Engineered Cast Stone Panel.

B. Adhesive: Construction adhesive or cement thinset mortar with bonding agent manufactured by and provided by others specifically designed for vertical tile or masonry bonding.

C. Joint Finishing: Caulked joints and perimeter shall be caulking sealant type and color recommended by caulking manufacturer and approved by architect. Grouting or pointing mortar by others shall be composed of one part non-staining cement (ASTM C91), one part hydrate lime (ASTM C207 Type S) and four parts clean, washed sand (ASTM C144). Coloring pigments may be added as required. The architect shall approve color of mortar before proceeding with grouting or pointing.

2.04 FABRICATION

A. Engineered Cast Stone Panels shall be manufactured in accordance with manufacturer's strict guidelines for ingredient ratios, material mixing and consolidation, mold surface integrity, color and finish uniformity and curing methods for maximum strength achievement.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect adjacent construction for conditions that would prevent proper installation of Engineered Cast Stone Panels. Inspect substrate for soundness and surface adhesion quality.

B. Upon delivery, inspect packing crate for any signs of damage in transit and note damage on shipping manifest prior to accepting delivery. Immediately notify shipper of any visible damage to the unpacked crate. Inspect Engineered Cast Stone Panels inside crates for any hidden damage from shipping. Notify manufacturer of any hidden damage within 24 hours of receipt. Inspect product for any variations in color, finish, tolerance or design as shown on manufacturer's shop drawings or architect's plans. Report any discrepancy to manufacturer.

3.02 INSTALLATION

A. Install Engineered Cast Stone Panels true, plumb and level in accordance with manufacturer's installation instructions and Tech Data sheet. All pieces shall be set by experienced and qualified stone masons or tile setters in accordance with the shop drawings and construction documents.
   1. Installer shall use necessary personal safety equipment to protect against hazards associated with stone and mortar fabrication, assembly and installation.
   2. All Engineered Cast Stone Panels shall be installed according to specifications included herein. Additional specifications shall apply if requested. Ultimate connection design is the responsibility of Building Design Engineer, Architect or otherwise responsible person charged with the design connection.
   3. All substrate to receive Engineered Cast Stone Panels shall be prepared as indicated in manufacturer's Tech Data sheet. Substrates shall be clean of any oil, paint, dust or debris. Surface shall be smooth, level, sound and capable of a successful and permanent adhesion to the setting material.
   4. When setting with mortar, all pieces not thoroughly wet shall be drenched with clear potable water and excess water removed just prior to setting.
   5. Unless otherwise noted, every piece shall be set in a full bed of mortar with all vertical joints flushed full. All anchors shall be firmly in place and all anchor holes and similar holes filled completely with mortar.
   6. After setting, if required, each piece shall be braced with a diagonal support to the face and rest on a previously installed temporary horizontal ledger to be removed after full cure of setting material. The face of each piece shall then be sponged off to remove any splashed mortar or mortar smears.
   7. All pieces shall be protected from splashing mortar or damage by other trades. Any foreign matter splashed or rubbed on the pieces shall be removed immediately.
   8. A foam or wood "plug" 1/2'' larger than the intended piece shall be temporarily installed on the substrate in applications where Engineered Cast Stone Panels are not immediately available or construction conditions prohibit a timely installation. This plug shall be removed and typical installation shall proceed according to this section.
   9. 1/4'' minimum tolerance required in surrounding opening dimensions (i. e. 24'' sq. Engineered Cast Stone Panels requires a 24 1/2'' sq. opening).

3.03 PATCHING

A. The repair of chipped or damaged Engineered Cast Stone Panels shall be done only by mechanics skilled in this work with materials furnished by the manufacturer and according to his direction.

B. Engineered Cast Stone Panels shall show no obvious repairs or imperfections other than the minimal color variations when viewed with the unaided eye under good typical lighting.

3.04 CLEANING

A. The face of all Engineered Cast Stone Panels shall be cleaned where necessary by scrubbing with a bristle fiber brush, using soap powder and water and shall be rinsed thoroughly with clean running water. No acid or prepared cleaners shall be used without the approval of the manufacturer.

3.05 SEALING

A. After cleaning and drying and full cure of any cementitious grouts (approximately 30 days), Engineered Cast Stone Panels may be sealed with any commercially available masonry or stone sealer. Follow sealer manufacturer's instructions and first apply to an inconspicuous test area to determine job specific results.

END OF SECTION 04 72 00

SECTION 04 73 00 - MANUFACTURED STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes
   1. Manufactured stone veneer and Masonry Veneer Installation System (MVIS), including adhesives, mortars, grouts and sealants.
   2. Waterproofing membranes.
   3. Metal anchors, lath, and accessories.

B. Related Sections
   1. Division 04 Section - Cast Stone.
   2. Division 06 Section - Rough Carpentry.
   3. Division 06 Section - Wood Framing
   4. Division 07 Section - Plastic Film Air Barrier.
   5. Division 07 Section - Joint Sealants.

1.03 REFERENCES

A. American National Standards Institute(ANSI)
   1. ANSI A137 Specifications for Ceramic Tile

B. American Society for Testing and Materials (ASTM):
   1. ASTM C 847-Specification for Metal Lath

1.04 SUBMITTALS

A. Product Data.

B. Samples:
   1. Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.
   2. Full range of masonry pointing mortar colors.

C. Quality Assurance/Control Submittals:
   1. Qualifications:
      a. Proof of manufacturer qualifications.
      b. Proof of installer qualifications.
   2. Regulatory Requirements: Evaluation reports.
   3. Veneer manufacturer's installation instructions.
   4. Installation instructions for other materials.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: 10 Year Experience
   2. Installer Qualifications: Tile Setter or experienced Mason familiar with installation procedures for installing manufactured veneer with record of successful in-service performance of work of similar scale and complexity. Where Manufacturer requirements

are more stringent as required for installation or warranty of their products the most stringent requirements shall prevail.

B. Field Samples
   1. Construct sample wall panel in size as directed by Architect (6' x 6' minimum), with finish face of panels facing south.
   2. Panel shall indicate color range, texture range, bond, mortar color, and joint finish.
   3. Panel shall include facing, back-up, reinforcement, flashing, control joint, weep hole, ties, and accessories.
   4. Retain as reference standard for masonry work on project.

C. Pre-Installation Meetings:
   1. Convene a pre-installation meeting at least one week prior to commencing Work of this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of these specifications
   1. Store and protect products on site.
   2. Store adhesive installation materials and other moisture-sensitive materials in protected enclosures;
   3. Handle by methods which avoid exposure to moisture.

1.07 WARRANTY

A. Provide manufacturer's Written warranty for a period of (15) years from the date of substantial completion against defects in materials and workmanship. Provide 15-year Warranty for "Laticrete" MVIS.

1.08 EXTRA MATERIALS

A. Provide minimum 2% additional stone and corner stone attic stock after the project is complete, for future repairs. Additional material shall be in proportions that are representative of the various sizes and colors of materials that were installed in the finished Work. It should also be from the same production run as the installed material as required to ensure minimal variation in colors.

1.09 PROJECT CONDITIONS

A. Protection of Manufactured Stone Veneer: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of veneer assemblies.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
   1. When ambient temperature exceeds 100 deg F or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Coronado Stone Products Inc. Tel: (972) 434-2515
2025 Country Club Dr.
Carrollton, Texas 75006 Website: www.coronado.com

B. Style and Color: As indicated in exterior materials legend on drawings.

2.02 MATERIALS

A. Veneer Units: Precast veneer units consisting of portland cement, sand, lightweight aggregates, and mineral oxide pigments.
1. Physical Properties:
   a. Compressive Strength: ASTM C 513, 5 sample ave 2,200psi(15 MPa)
   b. Shear Test: ASTM C 482, 50 psi (335 kPa)
   c. Water Absorption: UBC Standard 32-12, 22 percent
   d. Freeze-Thaw Test: ASTM C 67, 0.67 percent
   e. Thermal Resistance: ASTM C 177 RO.60 (0.11)
   f. Density: ASTM C 567 (Dry density) 75 pcf (1200 kg per m3)
2. Provide corner shapes at all outside corners as applicable.

B. Manufactured Stone Sill Trim: Coronado Stone 900 Series Sill in #2 Grey

C. Moisture Barrier: Tyvek Stucco Wrap, or approved equal.

D. Air Barrier: Tyvek Commercial Wrap, or approved equal.

E. Air and Moisture Barrier at wall-above-roof conditions and where otherwise indicated: Reference Division 07 Specification “Modified Bituminous Sheet Air Barriers”.

F. Lath: Galvanized expanded diamond wire lath complying with code agency requirements for the type of substrate over which stone veneer is installed.

G. Masonry Veneer Installation System (MVIS):
1. Laticrete 3701 Fortified Mortar Bed: one-step polymer fortified blend.
2. Laticrete Hydro Ban: single component self curing liquid rubber polymer.
3. Laticrete Masonry Veneer Mortar: polymer-fortified mortar
4. Laticrete Masonry Pointing Mortar: color as selected by Architect from manufacturer’s standard range.
5. Water: Potable, non-staining.

H. Accessories:
1. Laticrete Latasil: High-performance silicone sealant.
2. Latipoxy Waterproof Flashing Mortar: 3-component waterproofing membrane.
3. Metal Flashings: Metal flashings as detailed and specified herein to weep moisture at the bottom of the system.

PART 3 - EXECUTION

3.01 PREPARATION

A. System #W265 Over Sheathed Surface: Install one layer of weather-resistant barrier U.B.C. Standard No. 17-1 Tyvek Stucco Wrap. The air barrier shall be applied horizontally with the upper layer lapped over the lower layer not less than 4 inches. Where vertical joints occur, the felt or paper shall be lapped not less than 6 inches. Over the Stucco Wrap, apply a layer of Tyvek Commercial Wrap per manufacturer’s instructions. Install flashing to allow moisture flowing down the exterior face of the stucco wrap to wick out at the bottom of the

coursing. Then install 3.4 lb (or heavier as recommended by manufacturer) galvanized diamond mesh expanded metal lath. Overlap lath sides by not less than ½" and lath ends by not less than 1 inch. Attach the metal lath per manufacturer's instructions with the small cups pointing upwards. Double wrap metal lath a minimum of 16" around all inside corners. Then apply a coat of Laticrete 3701 fortified mortar bed over the metal lath and allow it to set. Apply a coat of Laticrete Hydro Ban, then Laticrete Masonry Veneer mortar.

B. Masonry Layout and Coursing:
   1. Precautions should be taken to establish and maintain elevations, lines, levels and coursing.
   2. Verify openings, edges, and other similar limitations prior to installation. Maintain ¼" to 3/8" gap at dissimilar materials for application of sealants.
   3. Achieve a balanced pattern of shapes, sizes, colors, thicknesses and textures by selecting and mixing the various stones. Select and mix stones from different boxes throughout the installation.
   4. For standard installation procedure, veneer is applied from the top down. This helps to keep the stone clean. Install the corners first for easiest fitting. Corner pieces have a long and a short return. These should be alternated in opposite directions on the wall corner. Outside corners and other accessory or specialty stone are to be used when applicable.

C. Bottom Course Weep Flashing:
   1. Provide aluminum weep screed, as recommended in Tyvek Stucco base detail. Attach screed top flange behind Stucco Wrap. Install additional flashing piece between Stucco Wrap & Commercial Wrap to allow water to weep between membranes. Do not block flow with mortar materials.

3.02 APPLICATION

A. Fitting Stones
   1. Stones should be installed with uniform size grout joints. A consistent ½" or less space around the stones is desirable. Long, straight unbroken joint lines should be avoided.
   2. Use chalk lines as guides for keeping the installation level and use a level during the installation of individual pieces. Stagger the joint lines both vertically and horizontally as per coursing to be achieved.

B. Trimming Stones
   1. For best fit, stones can be cut or shaped using a hatchet, widemouth nippers or a mason's trowel edge. Straight cuts can be made with a diamond or carbide saw blade. Cut edges should be turned so they are not visible (down when below eye level and up when above eye level). To conceal cut or broken edges, cover them with mortar when grouting.

C. Setting The Stone
   1. Using a mason's trowel, apply a ½" thick even layer of mortar to the entire back of the stone. Then press the stone firmly into place on the prepared wall surface, squeezing the mortar out around all edges. Using a gentle wiggling action while pressing the stone will insure a good bond.
   2. If the stone is being installed onto a very dry surface or in a hot/dry climate, the stone and wall surface should be wet to prevent excessive absorption of moisture from the mortar. This can be done by spraying or brushing water onto the back of the stone and the wall surface and/or by dipping the stone into a container of water. In either case the stone and the wall surface should be allowed to dry for a few minutes after wetting to eliminate excess surface water.

3. If any mortar accidentally gets on the stone face, do not try to wipe it off as it will smear and stain the stone. The mortar should be allowed to set until dry and crumbly, and then brushed off with a dry whiskbroom.

D. Pointing The Joints
   1. After the stone has been applied to the wall surface, use pointing mortar to fill the joints, forcing mortar into any voids. Be careful not to smear mortar onto the face of the stone. Any mortar that accidentally gets on the stone should be allowed to set until dry and crumbly, and then brushed off with a dry whiskbroom.
   2. Maintain ¼" to 3/8" uniform clearance for application of sealants at all dissimilar materials.

E. Finishing The Joints
   1. When the mortar joints become firm, use a wooden or metal striking tool to rake out the excess mortar to the desired depth while at the same time forcing the mortar into the joints so as to thoroughly seal the stone edges. Be careful not to work the joints too soon or mortar will smear.
   2. After working the joints, use a whiskbroom to smooth the joints and clean away any loose mortar from the joints and stone face. Loose mortar and mortar spots which have set for only a few hours clean up easily and should never be allowed to set up overnight. Do not use wet brushes or sponges to wipe the joints or clean mortar off the face of the stone as it will smear and stain. Also, never use wire brushes or acid on the stone surface.

3.03 CLEANING

A. Remove excess mortar and smears.

B. Clean soiled surfaces in accordance with manufacturer's instructions. Use non-metallic tools in cleaning operations.
   1. Wash with soft bristle brush and water/granulated detergent solution.
   2. Rinse immediately with clean water.

C. Removing Efflorescence:
   1. Allow veneer to dry thoroughly.
   2. Scrub with soft bristle brush and clean water.
   3. Rinse immediately with clean water; allow to dry.
   4. If efflorescence is still visible, repeat above procedure using a solution of 1 part household vinegar and 5 parts water.
   5. Rinse immediately with clean water.

D. Upon completion of work of this section, remove related debris from premises.

END OF SECTION 04 73 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Standard Form of Construction Agreement, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: This section covers furnishing all labor, materials, equipment, and services in connection with the furnishing, fabrication and erection of all structural steel work complete including:
   1. Steel Columns
   2. Steel Beams
   3. Shelf Angles
   4. Bolts
   5. Angle Frames Around Openings
   6. Laboratory Control
   7. Leveling Plates and anchor plates not cast in concrete or masonry.
   8. Shop Painting

B. Include all supplementary parts and members necessary to complete the structural steel frame, regardless of whether all such parts are definitely shown or specified, and furnish all such bolts, gussets, plates, etc. as may be required for proper assembly of all items.

C. Related Sections:
   1. Division 01 Section “Quality Requirements.”
   2. Division 05 Section “Metal Fabrications.”

1.03 DESIGN

A. Structural Performance: Engineer structural steel connections not specifically detailed by the Contract Documents to withstand design loadings indicated. Beam connections shall be standard AISC double angle unless shown otherwise.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, supervise Shop Drawings, and select other structural data for structural steel connections.
   1. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is

experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

C. Substitutions: Substitutions of sections or modifications of details, or both, and the reasons therefore, shall be submitted with the shop drawings for approval. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the fabricator and shall be accomplished at no additional cost to the Owner.

D. Responsibility for Errors: The fabricator shall be responsible for all errors of detailing, fabrications, and for the correct fitting of the structural members.

E. Templates: Templates shall be furnished by the fabricator with instructions for the setting of anchor bolts.

1.04 CODES

A. American Institute of Steel Construction:
   1. Specification for Structural Steel Buildings with commentary (AISC Manual of Steel Constuct 14th Edition).
   2. Code of Standard Practice for Steel Buildings and Bridges, 2010.

      However, the following sentence in paragraph 4.2.1 shall not apply: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as part of his preparation of these shop drawings.

   3. Specification for Structural Joints using ASTM A325X Bolts or A490X Bolts, December 31, 2009.

B. American Welding Society:
   1. Structural Welding Code-Steel. AWS D1.1.

C. Industrial Fasteners Institute:
   1. Handbook on Bolt, Nut and Rivet Standards.

D. Steel Structure Painting Council:
   1. Painting Manual, Volume 1, Good Painting Practice.
   2. Painting Manual, Volume 2, Systems and Specifications.

1.05 SUBMITTALS

A. Comply with pertinent provisions of Division 01 Section "Submittal Procedures", unless otherwise indicated.

B. Shop Drawings: Submit detailed shop and installation drawings, including design calculations for connections of the structural steel, to the Engineer for review. Steel for which such drawings have not yet been reviewed shall not be fabricated. Such review will cover the general conformance of design. The omissions from the shop and installation drawings of any materials shown on the Specifications shall not relieve the contractor of the responsibility of furnishing and installing such materials, even though such drawings may have been returned and reviewed.

C. Shop Drawings detailing fabrication of structural steel components:
   1. Include and indicate details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Indicate details of cuts, connections, splices, cambers, holes, and other pertinent data.
   3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
   4. Shop drawings shall be drawn at 1/8" = 1'-0" minimum for plans and ¾" = 1'-0" minimum for sections. Contract drawings shall not be reproduced in whole or in part. Contract drawings modified into shop drawings will be returned without review.
   5. Each sheet of the shop drawings shall bear the review stamp of the Contractor indicating the drawings have been reviewed and is approved. Shop drawings not bearing the Contractor's stamp will be returned without review.

D. Certified mill test reports, evidencing conformity with the requirements of the A.S.T.M. and A.I.S.C. Specifications, shall be submitted to the Architect, Structural Engineer, and Contractor for their respective records. Mill test reports will not be returned or approved.

E. Failure by the contractor to submit the shop drawings and test reports required above shall release the Architect and the Engineer from any liabilities due to the negligence on the part of the Contractor to comply with the construction documents.

PART 2 - PRODUCTS

2.01 MATERIAL GRADES

A. Steel Plates, Channels, and Angles – ASTM A36

B. Steel Wide Flange – ASTM A992

C. Steel HSS Tubes – ASTM A500, Grade B

D. Steel Pipes – ASTM A53, Grade B

2.02 BOLTS

A. Bolts: Anchor bolts and erection bolts shall have minimum conformance to ASTM F1554 and to the requirements for regular hexagon bolts and nuts of ASA Standards B18.2.1 and B18.2.2.

B. High Strength Bolts and Nuts: ASTM A325X with the thread excluded from the shear plane. Bethlehem "Load Indicator Bolts" or LeJeune "Tension Control Fasteners" complete with mating nut and washer and J&M Turner load-indicator washers may be used.

C. Washers: Circular washers shall be flat and smooth, and shall conform to requirements of Type A washers in ASA Standard B27.2. Beveled washers for American standard beams and channels shall be square or rectangular, shall taper in thickness, and shall be smooth. Washers for use with high strength bolts shall be hardened.

D. Adhesive Anchors: Injectable adhesive for the installation of threaded anchors rods into concrete. Rods shall be ASTM A36. Adhesive shall be Hilti- HIT HY 200 or Simpson Acrylic-tie or approved equal.

E. Drilled Anchors: Mechanical anchors shall be Simpson Strongtie, Titen HD screw anchors, or approved equal.

2.03 WELDING ELECTRODES

A. Shall conform to the requirements of the Specifications of the American Institute of Steel Construction. Use E70 electrodes.

2.04 COATINGS

A. Paint: Shall conform to the requirements of Federal Specification TT-P-86 Type I of II, SSPC Paint 4-64T or Federal Specification TT-P-636C primer coating, synthetic, rust inhibiting primer. Tnemic series “1009” gray primer, or approved equal. Tnemec Paint Company, North Kansas City, Missouri.

B. Zinc-Coating: When galvanizing steel is required, the zinc-coating shall conform to ASTM A123 . Zinc-coating for threaded products shall conform to ASTM A153.

C. Cold galvanizing compound shall be “ZRC Cold Galvanizing Compound” as manufactured by ZRC Chemical Products, Quincy, Massachusetts.

PART 3 - EXECUTION

3.01 FABRICATION

A. General: Except as modified herein, fabrication shall be in accordance with the applicable Specifications and Standards of the American Institute of Steel

Construction. Workmanship shall be equal to standard commercial practice in modern structural shops. Portions of the work exposed to view shall be finished neatly. Structural material, either plain or fabricated, shall be stored above the ground on platforms, skids, or other supports. Material shall be kept free from dirt, grease, and other foreign matter, and shall be protected as far as practical from corrosion. All material shall be clean and straight. If straightening or flattening is necessary, it shall be done by a process in a manner that will not damage the material. Finished members shall be free from undue twists, bends, warping distortion, and other irregularities. Holes shall not be made or enlarged by burning. Shearing, flame cutting, and chipping shall be done carefully and accurately. Splicing structural steel members shall not be permitted.

1. Compression joints, depending upon contact bearing, shall have the bearing surfaces machined to a common plane after the members are completed.
2. Protective Painting: One (1) coat of approved primer shall be applied to all exposed surfaces of all structural steel members except those surfaces requiring field welding, to be encased in concrete, to be galvanized, to be spray fireproofed and the top flanges of beams to support metal deck.

   All metal surfaces to be painted shall be cleaned of all loose mill scale, dirt, rust, etc. by the use of steel scrapers, wire brushes, sandblast or other means approved by the Architect. Oil and grease shall be removed with naphtha and the metal surfaces shall be dry when paint is applied.

   Paint shall not be applied during damp weather, or when the temperature is at or below freezing. Any damage to the shop coat of paint and welded areas where shop paint was omitted shall be field painted with shop paint to the satisfaction of the Architect.

   Steel work specified to have no shop paint shall, after fabrication, be cleaned of oil or grease by solvent cleaners and be cleaned of dirt, and other foreign material by thorough sweeping with a fiber brush. Apply shop paint to provide a minimum dry film thickness of 2.0 mils.

3. Bolted Construction: Holes for bolted construction shall be fabricated as specified for bolted construction. Bolt holes shall be at right angles to the member. The slope of bolted parts in contact with the bolt head shall not exceed 1:20 with respect to a plane normal to the bolt axis. Where the surface of a bolted part has a slope of more than 1:20, a beveled washer shall be used to compensate for the lack of parallelism. Bolt holes shall have a nominal diameter not greater than one-sixteenth (1/16) inch in excess of the nominal, bolt diameter.
4. Common Bolts: The bolts shall be of such length that they will extend entirely through the nuts, with the beveled end outside the nut. Bolt heads and nuts shall be drawn tight against the work with a suitable wrench not less than fifteen (15) inches long. Threads shall be excluded from shear plane
5. Baseplates: Oversize anchor bolt holes in baseplates to facilitate erection as follows:

Bolts 3/4” to 1” in diameter: 5/16” oversize
Bolts 1” to 2” in diameter: 1/2” oversize

Use oversize nut or plate washers under nut at all oversized holes in baseplates. Washers must be large enough to cover hole. Washer thickness shall be at least 1/8 of bolt diameter.

6. Camber: Provide camber in members indicated on the drawings. Specified camber applies at the jobsite, just prior to erection, lying flat so that the member weight has no effect. Take necessary precautions to prevent or compensate for camber loss during shipment. Measured camber in members up to 50’-0” long shall be within a tolerance of minus 1/2” to plus zero from the specified camber. Members with field measure camber outside the specified camber shall be returned to the shop.
7. Galvanizing: members shall be hot dip galvanized where indicated on drawings.

3.02 ERECTION

A. General: Except as modified herein, erection shall be in accordance with the applicable Specifications and Standards of the A.I.S.C. Manual of Steel Construction. Where parts cannot be assembled or fitted properly as a result of errors in fabrication or of deformation due to handling or transportation, such condition shall be reported immediately to the testing laboratory for approval of the method of correction obtained. The straightening of plates and angles or other shapes shall be done by approved methods. Bent or damaged heat-treated parts will be rejected. Steel work shall be drained properly; pockets in structures exposed to the weather shall be filled with an approved waterproof material. The erector will be responsible for shrinkage and distortion of all butt welds. Loose joints will be corrected by cutting with a hand guided torch if necessary.

B. Assembly:
1. Temporary bracing shall be used wherever necessary to support all loads to which the structure may be subjected, including equipment and operation thereof and piles of materials. Such bracing shall be left in place as long as required for safety. The various members forming parts of a completed frame or structure after being assembled shall be aligned and adjusted accurately before being fastened. Splicing of compression members shall be done after the abutting surfaces have been brought into contact.
2. Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled. Bearing plates shall be set in exact position and shall have a full and even bearing upon the concrete. As erection progresses, the work shall be bolted or welded sufficiently to take care of all dead load, wind, and erection stresses. Splices will be permitted only where indicated. All erection bolts used in welded construction may be

tightened securely and left in place; if removed, the holes shall be filled with plug welds.

C. Field bolting shall be in accordance with the requirements specified for shop fabrication. Unfair holes shall be corrected by reaming. Where the surface of a bolted part has a slope of more than 1:20, a beveled washer shall be used to compensate for the lack of parallelism. Bolt heads and nuts shall be drawn tight against the work with a suitable wrench not less than fifteen (15) inches long. Bolt heads shall be tapped with a hammer while the nut is being tightened.

D. Bolts to be "snug-tight" unless noted otherwise, and shall be tightened a few impacts of an impact wrench or the full effort of a man using a ordinary spud wrench, bringing the plies into contact. Field welding shall be as specified for shop fabrication of welded construction. Any shop paint on surfaces adjacent to joints to be field welded shall be wire brushed to reduce the paint film to a minimum. Slag shall be removed from all completed welds.

E. Field repair of zinc-coatings with cold galvanizing compound per manufacturer's specifications.

F. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

G. Setting baseplates: Set baseplates on shims or other adjustment devices. Tighten anchor bolts after supported members have been positioned and plumbed. Cut off protruding wedges or shims. Grout under baseplates in accordance with Division 3: Section Cast-in-Place Concrete.

3.03 FIELD QUALITY CONTROL

A. An independent testing laboratory shall perform inspection and testing services specified in this section.

B. Shop Inspection
   1. Visual inspection of all shop welding.
   2. Ultrasonic inspection of all full penetration welds.
   3. Examination of galvanizing.
   4. Examination of shop painting.

C. Field Inspection
   1. Proper erection of all pieces.
   2. Proper installation of all bolts, including checking the calibration of impact wrenches used with high strength bolts.
   3. Plumbness of structure and proper bracing.
   4. Ultrasonic inspection of all full penetration welds.

5. Record and measure camber of beams upon arrival and before erection for compliance with the specified camber. Measure beam lying flat with web in the horizontal position. Members outside the specified camber tolerance shall be returned to the shop and replaced with members meeting the specified camber tolerance.

D. Qualification of Welders: Before assigning any welder to work covered by this section of the Specifications, the fabricator shall provide the Testing Laboratory with certification that each of the welders to be employed on the project has passed qualification tests within the last year using procedures covered in the American Welding Society Standard D1.0-63.

E. The contractor shall be responsible for furnishing fabrication and erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6. Submit records of inspections and tests to the testing laboratory for their review.

F. Inspection of shop and field welding shall be "verification inspection" in accordance with Section 6 of AWS D1.1 and as follows:
   1. Visually inspect the welding of all shop fabricated members and note the location of all cover plates, connectors, bearing stiffeners, splices, and fillet welds for proper return around ends and check for seams, folds, and delaminations.
   2. Ultrasonically test all full penetration welds in accordance with ASTM E164.
   3. Root passes shall be thouroughly inspected for cracks. All cracks shall be gouged out and rewelded to two inches beyond each end of the crack.
   4. Mark all welds requiring repairs and make reinspections.
   5. The Testing Laboratory inspector shall advise the Owner and Architect of any shop and/or field conditions which, in his opinion, may require further tests and examination. Such further tests shall be performed as authorized by the Owner and Architect.
   6. The Owner reserves the right to use ultrasonic or radiographic inspection to verify the adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.

G. Inspection of bolted construction shall be in accordance with AISC "Specification for Structural Steel Buildings" and as follows:
   1. All bolts shall be visually inspected to ensure that the plies have been brought into "snug" contact.
   2. High strength bolts shall be inspected in accordance with Section 9 of the AISC "Specifications for Structural Joints Using ASTM A325X or A490X Thread Excluded Bolts."
   3. For all high strength bolts, unless specifically noted on the Drawings to require only "snug-tight" installation, the inspector shall observe the required jobsite testing and calibration, and shall confirm that the procedure to be used provides the required tension.

END OF SECTION 05 12 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General: Furnish all labor, supervision, materials, tools, equipment, appliances and services necessary for the fabrication, delivery and installation of all miscellaneous metal items. All work shall be as shown or indicated on the drawings and as specified in this section.

B. Scope of Work:
   1. Embedded angles and plates
   2. Guardrails, Handrails, and Handrail Brackets
   3. Ladders
   4. Steel Countertop Supports
   5. Steel Equipment Supports
   6. Metal Gratings
   7. Pipe Guards
   8. Downspout Protection
   9. Pipe Bollards
   10. Vehicular Sign Posts
   11. Steel Gate Frames
   12. Miscellaneous metal work and related items.
   13. Shop Priming of Metal Fabrications

C. Related Sections include the following:
   1. Division 03 Section - Concrete.
   2. Division 05 Section - Aluminum Ladder.
   3. Division 06 Section - Rough Carpentry, for concealed blocking for attachment of metal fabrications.
   4. Division 09 Section - Painting.
   5. Division 32 Section - Wood and Composite Fencing

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, miscellaneous supports and railings, including engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design Criteria:
   1. Ladders and stairs designed to withstand live loading conditions of 100 lb. per square feet.
   2. Handrails, Guardrails, or other protective enclosures shall be designed to withstand stresses to which they would be normally subjected, and to support a load of 50 lb per linear foot applied perpendicular at the top of the rail or guard, and to withstand a load of 200 lbs. applied in any direction at any point on the top of the rail or guard without deflection.
   3. Connections other than those already listed shall be designed to safely support design load (dead load plus live load) of not less than 100 psi without exceeding working stresses permitted for materials.

4. Design ladders to include platforms and safety cages where shown in Drawings and where required by local code and authorities having jurisdiction.
5. Miscellaneous countertop supports designed to safely support a load of 200 lb per linear foot of countertop applied at the outside edge, as well as any additional requirements as specified in Division 06 Section - Architectural Woodwork.
6. Miscellaneous equipment supports per local code requirements, equipment Manufacturers' requirements and as specified herein.

1.04 QUALITY ASSURANCE

A. Steel stairs in accordance with latest NAAMM Standards and AISC.

B. Welding shall conform to American Welding Society's Standard Code for Arc and Gas Welding in Building Construction. Welding shall be continuous along entire area of contact, except where tack welding is specifically shown or specified. Grind all exposed welds.

1.05 SUBMITTALS

A. Shop drawings based on the Contract Documents shall be submitted to the Architect for review prior to ordering of materials.

B. Failure by the contractor to submit shop drawings, test reports, etc. required above shall release the Architect and the Engineer from any liabilities due to the negligence on the part of the contractor to comply with the construction documents.

C. Approval will cover size and arrangement of members, character of construction, but not dimensions.

D. Contractor shall verify actual dimensions at the construction site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Comply with the following standards, as pertinent:
1. Steel plates, shapes, and bars: ASTM A36;
2. Steel plates to be bent or cold-formed: ASTM A283; grade C;
3. Steel tubing (hot-formed, welded, or seamless): ASTM A500; grade B;
4. Steel bars and bar-size shapes: ASTM A306; grade 65, or ASTM A36;
5. Cold-finished steel bars: ASTM A108l
6. Cold-rolled carbon steel sheets: ASTM A336;
7. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525;
8. Stainless steel sheets: AISI type 302 or 304, 24 ga. with number 4 finish;
9. Gray iron castings: ASTM A48, class 10;
10. Malleable iron castings: ASTM A47;
11. Steel pipe: ASTM A53, grade A, schedule 40, black finish unless otherwise noted;
12. Concrete inserts:
    a. Threaded or wedge-type galvanized ferrous castings of malleable iron complying with ASTM A27.
    b. Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.
13. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, grade A.
14. Lag bolts: Provide square-head type complying with Fed Spec FF-B-561;
15. Machine screws: Provide cadmium plated steel type complying with Fed Spec FF-S-111.

B. Castings shall be made from the best grade of soft pig iron cast in stove place molding sand to a uniform thickness. Castings shall be free of defects impairing strength or appearance.

C. Accessories: Provide all anchors bolts, anchor straps, hangers and other related fittings, fastener and accessories required for proper and secure installation of all miscellaneous metal. Fasteners for exterior use shall be zinc coated. Generally, the sizes, shapes and spacing of items are shown or specified; where not shown or specified, accessories shall be adequate for the required services, subject to approval.

2.02 ITEMS TO BE PROVIDED

A. Steel Pipe Guardrails: 1-1/2" outside diameter standard steel pipe as detailed in Drawings.

B. Steel Pipe Hand Railings: 1-1/2" outside diameter standard steel pipe fabricated with welded and round smooth connections as illustrated on Drawings or as required. All railings to have closed ends.
   1. Where railings do not return to post or to a vertical or horizontal surface, provide domed ends.
   2. Except where specifically detailed otherwise, railings in new concrete shall be mounted to cast-in galvanized steel sleeves.
   3. Heavy Duty Handrail Brackets: Model 386, as manufactured by Julius Blum & Co
   4. Provide any other attachments to new and existing construction as required to comply with design loading criteria.

C. Steel Ladder: Fabricate tower access ladder to configurations as indicated on drawings and as follows:
   1. 3-3/8" x 1/2" plate stringers with 3/4" diameter solid steel rod rungs shouldered and welded to stringers.
   2. Rungs spaced not over 12" apart. Distance from centerline of rungs to walls or obstructions not less than 7".
   3. Stringers secured to wall by 1/4" x 3" x 7" bent steel plate brackets bolted to wall with 3/8" diameter toggle bolts. Brackets secured to wall at 24" O.C. turned inward.

D. Countertop Support Frames: Provide welded steel support frame for wide countertops without intermediate supports as indicated in Drawings, and as indicated in Division 6, Section - Architectural Woodwork. Provide steel tube posts located inside adjacent wall framing, with steel tube, channel, or angle horizontal beneath countertop as indicated in Drawings. Steel sizes indicated in Drawings are minimum sizes allowed; provide larger sizes where required to meet performance criteria and delegated design. The depth of the horizontal member must be designed to fit concealed behind the front vertical side of the countertop. Design connection to floor slab to support indicated loading and to fit within wall framing dimensions. Pre-drill for screw attachment / connection of countertop underlayment as directed by millwork fabricator / installer.

E. Miscellaneous Equipment Supports: Field verify all dimensions and provide miscellaneous steel support structure for wall and ceiling mounted equipment as follows:
   1. For ceiling mounted projector mounts, and locations and items as specifically detailed or other items called for in the Drawings or other Sections requiring miscellaneous steel supports for complete installation.
   2. Where not specifically detailed, design and provide supports as required for all other equipment to be provided or installed under this contract.
   3. All supports shall comply with requirements of the equipment Manufacturer(s) for support structure and shall provide adequate strength and secure attachment to building structure, braced against lateral movement.

F. Downspout Adapters:

1. A1 Downspout Adaptor as manufactured by Piedmont Pipe Construction, Inc., Denver, NC. (877) 489-0911 or approved equal. Stainless steel material. Size as required to transition from downspout to underground piping.
2. Finish: Powder coated in color to match downspouts.

G. Pipe Bollards: 6" Diameter galvanized schedule 40 steel pipe with concrete fill. Insert precast concrete domed cap into top of bollard.
1. Size: 7'-0" in length, recessed 3'-0" below-grade. 4'-0" height above grade, unless otherwise indicated in Drawings.
2. Paint: Refer to Division 09, Section "Painting". Colors: as selected by Architect.

H. Steel Gate: Tube frame with steel tube horizontals and verticals as detailed on drawings. Provide gate frames with truss rods and 8”x8”x1/4” triangular welded gusset plates at corners on back side of gate. Tap drill where required for cladding and hardware installation.
1. Gate Hardware: As shown in Drawings, and as follows:
a. Hinges: Heavy Duty gate hinges, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall be offset and permit gate to swing at least 120°. Provide three hinges for each leaf.
b. Latch: Extra Heavy Duty slide bolt latch with keep, lockable with padlock.
2. Cane Bolts: Provide heavy duty cane bolt for each leaf.
3. Pickets: Refer to Division 32 for composite / wood fencing / picket material.
a. Attachment to Gate Frame: Galvanized steel carriage through-bolts in locations as indicated on drawings. Nuts and washers on interior side of gate.
4. Finish for gate frame: galvanized.
5. Pre-drill frame as required for attachment of facing material(s) indicated in Drawings.

I. Miscellaneous Steel Shapes: Channels, angles, plates, tubing, connections and bolts provided where shown and detailed on drawings. Exterior embed plates, support angles, and other miscellaneous exterior steel shall be hot-dip galvanized.

2.03 SHOP PAINTING

A. All Iron and Steel Work: Unless otherwise specified, power tool clean all surfaces to remove mill scale. Work shall receive a shop coat of paint before leaving the factory or being exposed to the weather. Aluminum work contacting dissimilar metals shall receive a protective coating preventing galvanic action.

B. Shop Paint: Shop paint shall be Fabricator's standard, fast curing, lead free, "universal" primer, compatible with finish paint system indicated and for capability to provide sound foundation for field applied topcoats.

C. Aluminum surfaces to be in direct contact with concrete and masonry shall be shop coated with zinc chromate primer.

PART 3 - EXECUTION

3.01 FABRICATION

A. Contractor shall secure and be responsible for all field measurements required for the proper and accurate fabrication and installation of the items included under this section; field alterations will not be permitted except upon specific authorization of the Architect.

B. All work shall be assembled in the most substantial manner and reinforced where necessary with structural shapes, using concealed screws, bolts or similar fastenings. Make welds of adequate strength and durability, jointing tight, clean and smooth, flush and in true plane with base metals.

C. All screws or rivets shall be countersunk, unless otherwise noted. Provide lock washers for all bolts.

D. All steel to which wood blocking is connected shall be properly punched for anchoring blocking.

E. Exposed steel shapes with marred surfaces shall be ground or draw-filled to a fine grain finish, as approved before applying shop coat of paint.

F. Assembled work shall be completely constructed in the shop, accurately finished and the pieces match-marked for erection. Form exterior joints to exclude water, grind connections in exposed pieces smooth and polish.

G. The Contractor shall do all drilling, cutting, tapping and fitting of work to accommodate other work coming in contact with it, and shall furnish all taps, bolts and other fittings in connection therewith.

H. Except where otherwise noted, fastening to concrete, solid masonry or hollow masonry shall be with expansion bolts or anchors. Fastening to wood plugs will not be permitted. Toggle bolts may be used only when approved by the Architect.

3.02 INSTALLATION, GENERAL

A. All work included in this Contract shall be installed by the Contractor at the proper time and as rapidly as the progress of the adjacent and connecting work will permit.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true to line, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Field Welding:
   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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Touch-up shop prime coats.

F. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.03 INSTALLATION, SPECIFIC ITEMS

A. Miscellaneous Framing and Supports:

1. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
2. Anchor supports securely to and rigidly brace from building structure.

B. Metal Pipe Bollards:
1. Anchor bollards in concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard for positive drainage away from bollard base.
2. Fill bollards solidly with concrete.
3. Paint bollards color(s) as approved by architect.

C. Steel Gates:
1. Install gates square and plumb. Adjust tension on truss rod as required, after gate cladding is installed.
2. Install with all gate hardware as detailed in Drawings and described in this section.

3.04 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Framing with dimension lumber.
   2. Wood blocking, cants, and nailers.
   3. Wood furring and grounds.
   4. Plywood backing panels.

B. Related Sections include the following:
   1. Division 31 Section "Termite Control" for site application of borate treatment to wood framing.

1.03 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   4. SPIB: The Southern Pine Inspection Bureau.
   5. WCLIB: West Coast Lumber Inspection Bureau.
   6. WWPA: Western Wood Products Association.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Division 01 Section “Submittal Procedures”, unless otherwise indicated.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with re-

quirements. Indicate type of preservative used and net amount of preservative retained.

2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

C. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.05 QUALITY ASSURANCE

A. LEED Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
1. Dimension lumber framing.
2. Miscellaneous lumber.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings a minimum of 6 inches above ground on blocking.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Grade: No. 2 KD Grade Southern Yellow Pine or an equivalent strength grade. Refer to structural lumber properties schedule on drawings for required strength of substituted lumber.

B. Plywood:
   1. Exposed Plywood: Where plywood will be exposed in finished work, provide A-C/EXT-APA plywood with Grade A face exposed and Grade C concealed for exterior use; and provide A-D/INT-APA plywood with Grade A face exposed and Grade D concealed, for interior use.
   2. Concealed Interior Plywood: Where plywood will be concealed by other work, provide C-D Plugged/INT-APA.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.

2.03 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.

C. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade of any species.

2.04 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content of the following species and grade:
   1. Mixed southern pine, No. 2 grade; SPIB.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

2.05 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: C-C Plugged in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.06 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.07 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: 5-1/2” x 3/8” closed cell foam and adhesive backed peel and stick membrane, equal to Protecto Wrap (800-759-9727) “Triple Guard Energy Sill Sealer.”

2.08 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products as indicated in drawings.

B. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.09 WOOD TREATMENT

A. Preservative Treatment: Where lumber or plywood is specified herein or shown on drawings to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark requirements.
   1. Pressure-treat above-ground items with waterborne preservatives complying with AWPB LP-2. After treatment, kiln-dry to a maximum moisture content of 19 %.
   2. Treat wood nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing. Also treat wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry, concrete or plaster.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surfaces to receive new wood members shall be free of all dirt, debris and loose materials. Remove any projections as necessary.

B. Surfaces shall have no rain, dew, frost, etc. present.

3.02 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate blocking and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   3. Table R602.3(1), "Fastener Schedule for Structural Members"

J. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.03 INSTALLATION

A. Warped wood members shall not be used.

B. Lumber or Plywood to Lumber:
   1. Nail spacing shall be maximum of 12" on center and staggered across face of piece. Fastener shall be located within 3" of each end of piece. Maximum spacing of 6" on center, 8' each way from corners for roof edge blocking, unless otherwise noted on drawings.
   2. Wood framing and furring materials spaced 16" on center, attached at 8' on center at each support, unless noted otherwise.

3. Nail heads shall be flush with wood surface and nail shall penetrate adjoining piece minimum of 1.25 inches.
4. The installed withdrawal resistance shall be a minimum of 100 pounds per nail.

3.04 ROUGH CARPENTRY

A. Provide cutting, fitting, fabricating, blocking, nailing, and miscellaneous items of furring, grounds, blocking, screeds and nailers required to accommodate roofing, equipment, lavatory counter tops, accessories and other items, including NIC items requiring wood framing, blocking or furring. Materials erected plumb, level and uniformly true to plan providing all shims as required.

B. Fastenings for Wall Supported Items: Provide and install 2 x 8 (minimum) x 1 stud space wood blocking, unless specified otherwise at all stud wall areas receiving grab bars, toilet partitions, wall bumpers and other wall mounted accessories.

3.05 ROUGH HARDWARE

A. Provide bolts, screws, anchors, inserts and fastenings required for proper attachment of carpentry and millwork items. Fastenings to concrete or masonry with expansion bolts or anchors. Toggle bolts may be used for hollow masonry. Fastening to wood plugs not permitted. Fastenings spaced 16" o.c. unless otherwise noted.

3.06 FINISH CARPENTRY

A. Hollow Metal Frame Installation: Exercise care in setting of frames with head level and jambs plumb and square. Secure anchorages to adjacent construction, labeled frames secured per U.L. requirements. Leave spreader bars in place until frames are finally secured square and plumb.

B. Specialty Items: Receive specialty items such as toilet accessories and miscellaneous specialty items and install in accordance with approved shop and setting drawings, using proper fasteners. Install items plumbs, level and true, securely fastened with proper bolts or screws.

C. Miscellaneous Metal Items Installation: Receive miscellaneous metal items and install plumb, level and secure in strict accordance with approved shop drawings.

D. Wood attached to CMU: Secure wood items to CMU with anchors and bolts. Apply construction adhesive to wood prior to securing bolts.

3.07 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.08 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.09 CLEAN UP

A. Clean up all debris caused by the work in this section, keeping the premises clean and neat at all times. Upon completion of the work of this section, remove all related debris from premises.

END OF SECTION 06 10 00

SECTION 06 11 00 - WOOD FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Provide rough carpentry, wood framing, trusses, sheathing, and other items normally provided by framing trade and install such items listed herein furnished by other trades.

B. Related Sections include the following:
1. Division 03 Section “Concrete Formwork.”
2. Division 05 Section “Miscellaneous Metals.”
3. Division 06 Section “Rough Carpentry.”
4. Division 06 Section “Shop Fabricated Wood Trusses.”
5. Division 06 Section “Sheathing.”
6. Division 08 Section “Metal Doors and Frames.”

1.03 QUALITY ASSURANCE

A. Lumber Standards: Comply with PS 20 and with applicable rules of the respective grading and inspecting agencies for species and products used.

B. Plywood Product Standards: Comply with PS 1 (ANSI A 199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard for type of panel specified.

C. Framing Members: Shall comply with recommendations of "Manual for House Framing" of National Forest Products Association.

D. Anchor and Nail: Shall comply with "Recommended Nailing Schedule of Manual for House Framing" and other recommendations of N.F.P.A.

E. Pre-fabricated Wood Members: Comply with design standards for manufactured products set forth in CABO Report No. NER-200 and NER-126.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Division 01 Section “Submittal Procedures”, unless otherwise indicated.

B. Wood Treatment Data: Submit treatment manufacturer's instructions for proper use of each type of treated material. Include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards. Include statement that moisture content of treated materials was reduced to a maximum of 19% prior to shipment.

C. Prefabricated Wood Trusses: Submit calculations and engineering data.

D. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use and submit evidence of compliance with specified requirements. Compliance may be in form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.

1.05 HANDLING, DELIVERY AND STORAGE

A. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

1.06 COORDINATION

A. Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 - PRODUCTS

2.01 WOOD MATERIALS

A. Lumber, General:
   1. Factory mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
   2. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
   3. Provide seasoned lumber with 15% maximum moisture content at time of dressing.

B. Framing Lumber & Miscellaneous Lumber (2" through 4" thick and less than 6" wide):
   1. For light framing and miscellaneous lumber (furring, grounds, blocking) provide "Stud" grade lumber for stud framing and "Standard" grade for other light framing, any species. The Contractor may, at his option, use Standard Grade throughout.

C. Plywood:
   1. Roof Sheathing: Exterior, APA Rated Sheathing, Exposure 1, with span rating to suit joist or truss spacing; thickness as noted on drawings.
   2. Wall Sheathing: Exterior, APA Rated Sheathing with span rating to suit stud spacing; thickness as noted on drawings.
   3. Sub-Flooring: APA Rated Sheathing, Exposure 1, with span rating to suit joist spacing; thickness as noted on drawings.
   4. Backing Panels at Telephone and Electric Equipment: Provide C-D-INT-APA plywood with exterior glue, 1/2" thick.

D. Structural Framing (2” through 4” thick and 6” or wider):
   1. For structural framing, provide Southern Yellow Pine, visually graded No. 2 or better.

E. Pressure Treated Wood Sills: Blocking, furring, stripping and similar concealed members in contact with masonry or concrete, wood cants, nailers, curbs, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers, and waterproofing, shall be pressure treated using water-borne preservatives complying with AWPB LP-2. After treatment, kiln dry to a max. moisture content of 15%. Coat cut surfaces with same chemical used for treatment. Creosote or oil borne preservatives are prohibited.

2.02 MISCELLANEOUS MATERIALS

A. Provide metal hangers and framing anchors equal to Simpson Strong Tie as indicated on drawings or approved equal.

B. Fasteners: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.

C. Fasteners in Concrete & Masonry: Shall be approved "Wej-It" expansion shields set in properly drilled holes or "Redhead" self-drilling anchors and machine bolts.

D. Where rough framing work is exposed to weather or in ground contact, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A153).

E. Sill-Sealer Gaskets: 5-1/2” x 3/8” closed cell foam and adhesive backed peel and stick membrane, equal to Proteco Wrap, “Triple Guard Engergy Sill Sealer.”

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions where wood frame construction is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.02 INSTALLATION

A. General:
1. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
2. Protect all material from weather and handle with care.
3. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
4. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.
   a. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

B. Wood Framing, General:
1. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association.
2. Do not splice structural members between supports.

C. Stud Framing:
1. General: Provide stud framing where shown. Unless otherwise shown, use 2" x 4" wood studs spaced 16" O.C. with 4" face perpendicular to direction of wall or partition. Provide single bottom plate and double top plates 2" thick by width of studs; except single top plate may be used for non-load bearing partitions. Nail or anchor plates to supporting construction.
2. Construct corners and intersections with not less than 3 studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.
3. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

a. For non-bearing partitions, provide double-jamb studs and two 2" x 6" headers with plywood flitch.
b. For load-bearing partitions, provide double-jamb studs for openings 6' and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown, or if not shown, provide as recommended by N.F.P.A., "Manual for House Framing".

D. Joist Framing:
1. General: Provide framing of sizes and spacings shown. Install with crown edge up and support ends of each member with not less than 1-1/2" of bearing on wood. Attach to wood bearing members by toe nailing or metal connectors, or both; frame to wood supporting members with wood ledgers as shown, or if not shown, with metal connectors. Frame openings with headers and trimmers; double headers and trimmers where span of header exceeds 4'. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist or locate closer than 2" from top or bottom. Provide solid blocking (2" thick by depth of joist) at ends of joists unless nailed to header or brand member.
2. Lap members framing from opposite sides of beams, girders or partitions not less than 4" or securely tie opposing members together. Provide solid blocking (2" thick by depth of joists) over supports.
3. Anchor members paralleling masonry with 1/4" x 1-1/4" metal strap anchors spaced not more than 8' O.C. Extend anchors at least 4" into masonry, turn up 4" and extend over and fasten to 3 joists.
4. Under jamb studs at openings, provide solid blocking between joist.
5. Under non-load bearing partitions, provide double joists separated by solid blocking equal to depth of studs above. Provide triple-joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures, unless otherwise shown.
6. Provide bridging between joists where nominal depth-to-thickness ratio exceeds 4, at intervals of 8'. use bevel cut 1" x 4" or 2" x 3" wood bracing, double-crossed and nailed both ends to joists, or use solid wood bridging 2" thick by depth of joist, end nailed to joist.

E. Rafter and Ceiling Joist Framing:
1. Ceiling Joists: Provide member size and spacing shown, and as previously specified for joist framing. Face nail to ends of parallel rafters.
2. Rafters: Provide member size and spacing shown. Notch to fit exterior wall plates and toe nail or use special metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
a. At valleys, provide valley rafter of size shown, or if not shown, provide rafter twice as thick as regular rafters and 2" deeper. Bevel ends of jack rafters for full bearing against valley rafter.

b. At hips, provide hip rafters of size shown, or if not shown, provide of same thickness as regular rafters and 2" deeper. Bevel ends of jack rafters for full bearing against hip rafters.

3. Provide collar beams (ties) as shown, or if not shown, provide 1" x 6" boards between every third pair of rafters. Locate below ridge member, on-third of distance to ceiling joists. Cut ends to fit slope and nail to rafters.
4. Provide special framing as shown for eaves, overhangs, dormers and similar conditions, if any.

F. Trussed Rafters:
1. General: Provide trussed rafters where shown. Comply with the applicable requirements of the NLMA's, "National Design Specifications for Stress Graded Lumber and Its Fastenings", and the Truss Plate Institute's, "Light Metal Connected Wood Trusses".
2. Provide pre-engineered and shop-assembled trusses designed for the span, loading, truss shape and spacing shown. Fabricate in the plant of the manufacturer or his licensed fabricator.
3. Erect trusses in accordance with manufacturer's printed instructions. Provide temporary supports and bracing as required.

G. Plywood Roof Sheathing:
1. Provide plywood roof sheathing as required. Install with long dimension across supports, using panels continuous over 2 or more spans with end joints between panels staggered and located over center of supports.
   a. Refer structural drawings for nailing, spacing, and patterns.
   b. Provide support at unsupported long edges with "Plyclips" or wood blocking.
2. Allow 1/8" open space between end joints and 1/4" open space between edge joints for expansion and contraction of panels.

H. Plywood Wall Sheathing:
1. Provide plywood wall sheathing. Install horizontally or vertically using panels continuous over 2 or more spans. Nail edges and ends over supports at 6" O.C. and at 12" O.C. over intermediate studs, using 6d nails for panels not more than 1/2" thick and 8d nails for thicker panels or as noted on plans. Allow 1/8" spacing at panel ends and 1/4" at panel edges.
2. All wall sheathing shall be a cohesive glue-nailed system with adhesive the full length of every stud.
3. Over all new sheathing apply one layer of building paper as specified herein.

I. Plywood Flooring:
1. Sub-Floor: Install with the long dimension of the panel across supports and with panel continuous over two or more spans. Panel end joints shall occur over framing. Allow 1/8" spacing at panel ends and 1/4" at panel edges. Nail 4" O.C. along panel edges and 10" O.C. at intermediate supports and blocking with 6d common nails for 1/2" panels, 8d for greater thicknesses, or as noted on plans. Where panels are 1-1/8" or 1-1/4" thick and supports are 48" O.C., nails shall be 8d ring-shank or 10d common and space 6" O.C. at all supports.

J. Nailing: Where driving of nails causes splitting, holes for nails shall be sub-drilled. The following is the minimum schedule for common wire nails:

1. Double Top and Sole Plates: Lower member to studs - 2 - 16d; upper member to lower, staggered - 16d at 12"; at intersection - 3 - 16d.
2. Blocking Between Studs: End nail, each end - 2 - 16d and/or toe nail, each end - 2- 8d.
3. Ribbons to Studs: 1" - 2 - 8d.
4. Multiple Studs: For widths over 4", stagger - 16d at 12".
5. Studs to Bearings: Toe nails, each side - 2 - 8d.
6. No staples will be permitted as a substitute for nails.

3.03 CLEAN UP

A. Upon completion of work of this section, remove related debris from premises.

END OF SECTION 06 11 00

SECTION 06 16 00 – SHEATHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Wall sheathing.
   2. Roof sheathing.
   3. Subflooring.

B. Related Sections include the following:
   1. Division 06 Section "Wood Framing".
   2. Division 06 Section "Rough Carpentry".
   3. Division 07 Section "Plastic Film Air Barrier".
   4. Division 07 Section "Bituminous Dampproofing".

1.03 SUBMITTALS

A. Comply with pertinent provisions of Division 01 Section “Submittal Procedures”, unless otherwise indicated.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

6. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Preservative-treated plywood.
   2. Fire-retardant-treated plywood.

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: DOC PS 2, unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.02 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C9.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.03 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Comply with performance requirements in AWPA C27.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Use Exterior type for exterior locations and where indicated.
   3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
   4. Use Interior Type A, unless otherwise indicated.

B. Kiln-dry material after treatment to maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat plywood indicated on Drawings, and the following:
   1. Roof and wall sheathing within 48 inches of fire walls.
   2. Roof sheathing.
   3. Subflooring and underlayment for raised platforms.

2.04 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural Exposure 1 sheathing.
   1. Span Rating: Not less than span as indicated on drawings.
   2. Nominal Thickness: Not less than as indicated on drawings.

B. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.
   1. Span Rating: Not less than span as indicated on drawings.
   2. Nominal Thickness: Not less than as indicated on drawings.

2.05 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior Exposure 1 sheathing.
   1. Span Rating: Not less than span as indicated on drawings.
   2. Nominal Thickness: Not less than as indicated on drawings.

2.06 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: Exterior Exposure 1 single-floor panels or sheathing.
   1. Span Rating: Not less than to support joist spacing is required.
   2. Nominal Thickness: Not less than as indicated on drawings.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. For roof and wall sheathing, provide fasteners with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
   1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.08 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:
   1. Subflooring:
      a. Glue and nail to wood framing.
      b. Space panels 1/8 inch apart at edges and ends.
   2. Wall and Roof Sheathing:
      a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
      b. Space panels 1/8 inch apart at edges and ends.

3.03 PROTECTION

A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 06 16 00

SECTION 06 17 53 – SHOP FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Standard Form of Construction Agreement, including General and Special Conditions and Division 01 Specification Sections, apply to this Section

1.02 SUMMARY

A. Section Includes: Furnish labor, material, services, equipment and appliances required for prefabricated wood truss work indicated on the Drawings and specified herein.
   1. Wood trusses
   2. Bridging
   3. Temporary and permanent bracing
   4. Related hardware (as required) and including:
      a. Metal hangers
      b. Anchors
      c. Special metal shapes

B. Related Sections include the following:
   1. Division 06 Section “Rough Carpentry”
   2. Division 06 Section “Sheathing”
   3. Division 06 Section “Wood Framing”

1.03 ENGINEERING DESIGN

A. Trusses shall be custom designed to fit dimensions and loads indicated on the Drawings. Design shall be in accord with allowable values assigned by the most restrictive governing code. Complete design calculation showing internal layout member forces and stress control points are to be submitted to the Architect. Design shall be under the supervision of a registered professional engineer.

1.04 QUALITY STANDARDS

A. Trusses shall be manufactured in a plant approved for fabrication by the Owner.

B. The standards of Automated Building Components, Inc. for quality, engineering and fabrication shall govern the work of the section.

C. National Forest Products Association (NFPA): "National Design Specifications for Stress Grade Lumber and Its Fastenings."

D. American Institute of Timber Construction (AITC): "Timber Construction Standards".

E. Truss Plate Institute (TPI): "Design Specifications for Light Metal Plate Connected Wood Trusses".

F. American Society for Testing Materials (ASTM)

1.05 SHOP DRAWINGS

A. Comply with pertinent provisions of Division 01 Section “Submittal Procedures”, unless otherwise indicated.

B. Submit shop drawings bearing the seal of a professional engineer, licensed in the State of Texas, showing:
   1. Pitch, span, camber, dimensions and spacing of truss.
   2. Truss bearing sizes and locations.
   3. Design loading of truss and allowable stress increase.
   4. Axial forces in each truss member.
   5. Nominal sizes and location of connector plates at all joints.
   6. Size, species and stress of grade of lumber for all truss members.
   7. Permanent lateral bracing as required by design to reduce buckling length of individual truss members only.
   8. Handling and erection recommendations.

C. Submit design calculation for each truss sealed by a registerd professional engineer licensed in the State of Texas.

PART 2 - PRODUCTS

2.01 ITEMS TO BE PROVIDED

A. Prefabricated Wood Truss: Products designed and approved by Automated Building Components or approved equal.

2.02 FABRICATION

A. General: Components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced workmen, using precision cutting and truss fabricating equipment, under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control required by governing authority.

B. Cutting Members: Accurately cut to length, angle and true to line to assure tight joints for finished truss.

C. Connections: Properly place members and connectors in special jigs and tightly clamp members in place until the connector plates have been pressed into the lumber simultaneously on both sides of the joints.

D. Camber: As noted on accepted shop drawings by properly positioning the members in the fabricating jig.

2.03 MATERIALS

A. Lumber (No. 2 Southern Yellow Pine): Conform to the published stress ratings for the species and grades set out in the official grading rules of the appropriate lumber association or as listed in the reference specifications. Wherever this Specification, or notes on the plans or truss engineering design calls for lumber which exceed the minimum set forth therein, the Specifications, plans and/or truss engineering designs shall be applicable, and information stated or shown in one shall be applicable the same as if in all of them. All lumber shall conform to the species and fully recognized nominal sizes shown on the plans or truss engineering designs. All members shall be cut from lumber which bear the proper grade mark stamps of a recognized grading association or licensed lumber inspection agency. No lumber shall be used which does not appear to conform to the proper dimensions and/or grades. At the time of fabrication, the moisture content of all lumber shall be within limits stated in reference specifications.

B. Connectors:
   1. General: ASTM A446-72 Grade A prime commercial quality galvanized sheet steel of no less than 20 gauge thickness which has a minimum yield of 33,000 psi and a minimum ultimate tensile strength of 45,000 psi. Connectors shall have a series of nail-like projections which are designed to separate the fibers of the wood into which they are pressed, in accordance with accepted nailing practices. All connector plated truss joints shall be designed using the net area plating method as set forth in TIP Standards.
   2. Field Connectors: Where field assembly of truss sub-components is necessary, connections shall be in accord with details shown on accepted shop drawings.

C. Bracing: As required by accepted shop drawings.

D. Hardware: As required by accepted shop drawings.

PART 3 - EXECUTION

3.01 HANDLING

A. Perform in a manner to prevent bending, warping, twisting or other damage.

3.02 STORAGE

A. Store in a vertical position above ground on suitable supports and braced to prevent bending and/or tipping over.

3.03 PROTECTION OF MATERIALS

A. Protect from damage when stored at the job site. Finished members shall be free of bends, twists or open joints. Replace warped, bowed or damaged trusses at no additional cost to the Owner.

3.04 WORKMANSHIP

A. Use only skilled and experienced personnel.

3.05 ERECTION

A. Erect in complete accord with the plans and accepted shop drawings. Provide erection bracing in addition to specified bridging to keep trusses straight and plumb and to assure adequate lateral support for the individual trusses and entire system until decking material has been applied.

3.06 PROTECTION OF WORK IN PROGRESS

A. Apply no construction loads before trusses and bridging have been anchored. Install and secure permanent decking before applying full design loads.

3.07 CLEAN-UP

A. Upon completion of work of the Section, remove related debris from premises.

END OF SECTION 06 17 53

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Stairwork.
   2. Plastic-laminate paneling.
   3. Plastic-laminate cabinets.
   4. Plastic-laminate countertops.
   5. Closet and utility wood shelving.
   6. Shop finishing of interior woodwork.

B. Related Sections include the following:
   1. Division 05 Section - Metal Fabrications.
   2. Division 06 Section - Rough Carpentry for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
   3. Division 07 Section - Joint Sealants for sealing around architectural woodwork and countertops.
   4. Division 09 Section Resilient Flooring for rubber base installed at cabinet base boards.
   5. Division 22 Sections for plumbing fixtures and fittings.
   6. Division 26 Sections for electrical devices installed in architectural woodwork.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stair work are specified in Division 06 Section - Rough Carpentry.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details at not less than 1-1/2" scale. Submittal format shall be 30" x 42" sheets.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
   4. Show arrangement of splashes at countertops.
   5. Apply WI-certified compliance label to first page of Shop Drawings.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish with 1 sample applied to core material and specified edge material applied to 1 edge per countertop edge profile.
2. Corner pieces as follows:
   a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
3. Exposed cabinet hardware and accessories, one unit for each type, in selected finish.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer/fabricator.

B. Product Certificates: For each type of product, signed by product manufacturer.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.06 QUALITY ASSURANCE

A. Materials and Fabrication, General:
   1. Provide Custom Grade for plastic laminate finish, per AWI standards. Casework and Cabinetry shall be of reveal overlay design, unless otherwise specified or indicated on drawings.
   2. Casework shall minimally meet AWI Section 400A standards for plastic laminate finished custom grade casework.
   3. All dimensions, substrates, etc. shall be verified in the field by the Contractor.
   4. Use maximum length material for all trim, base, etc.
   5. Scribe and fit all cabinets and casework tightly to adjoining construction unless otherwise indicated.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
   1. Fabricator shall have had at least 5 years experience in projects of similar scope.

C. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

D. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.

E. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section - Project Management and Coordination.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and maintaining relative humidity within typical design operating range for the facility, during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. For appliances and equipment attached to or adjacent to millwork, coordinate required clearances and rough openings, prior to fabrication and prior to installation of cabinets.
   1. Prior to fabrication of millwork, Contractor to verify that appliance doors, handles, and controls do not conflict with doors and drawers of adjacent millwork, and adjust millwork dimensions or provide filler strips as required to allow full 90° opening of all doors, and full opening of drawers. Coordinate prior to utility rough in where solution involves changing the location of appliances.

C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section - Door Hardware (Scheduled by Describing Products) to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

1.10 EXTRA MATERIALS

A. Provide additional shelf brackets for adjustable cabinet shelves, minimum of one additional bracket per cabinet section with adjustable shelves, in manufacturer’s unopened packages.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:
   1. All lumber shall be kiln dried to a moisture content of 4-1/2 percent. Kiln dried lumber shall be tempered for not less than four weeks before using.
   2. Hardboard: AHA A135.4.
   3. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
   4. Particleboard: Use of particleboard core material is prohibited
   5. Softwood Plywood for Laminate finish: DOC PS 1, at semi-exposed surfaces unless noted otherwise.
   6. Medium Density Overlay Plywood (MDO): APA PS1-09, Exterior Grade B-B, MDO plywood.

C. Thermoset Decorative Panels: Medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
   1. Provide PVC edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates as scheduled in the drawings.

E. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, with exposed edges seamed before tempering, 1/4" thick, unless otherwise indicated.

F. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 1/4" thick.

2.02 CABINET HARDWARE AND ACCESSORIES

A. General:
   1. All hardware and accessory materials associated with architectural cabinets provided and installed by cabinet fabricator, except for items specified in Division 08 Section - Door Hardware (Scheduled by Describing Products).
   2. Finish for Exposed Cabinet Hardware (Typical unless otherwise noted): as selected by Architect from Manufacturer's available finishes.
   3. Finish for Concealed Cabinet Hardware (Typical unless otherwise noted): as selected by Architect from Manufacturer's available finishes.
   4. Provide all screws, fasteners, and miscellaneous hardware and attachments as required for complete installation.

B. Hinges:
   1. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal.
      a. Provide hinges designed for thick doors where thick or hollow core doors are detailed in Drawings.
   2. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 120 degrees of opening, soft-closing.
      a. Provide four (4) hinges per leaf at tall cabinet doors.
      b. Provide hinges designed for thick doors, where thick or hollow core doors are detailed in Drawings.

C. Cabinet Pulls:
   1. Bar Pulls: Satin stainless steel bar pulls, 6 inches long, 4 inch centers, minimum of 3/8 inch in diameter and 1-1/4 inches deep, equal to Swiss Kelly SK-0006.

D. Door and Drawer Locks: Each room of cabinets shall be keyed separately and with grandmaster into building system, unless otherwise noted. Verify keying with Owner prior to ordering locks. Provide 2 keys per lock unless otherwise noted.
   1. Disc Tumbler Cam Locks: As manufactured by CompX National, or equal. Cam configuration to suit applications.
   2. Double Door Locks: CompX Double Door Latch, with catches at both top and bottom of doors.

E. Adjustable Shelf Pilasters and Supports in Cabinets: Four Flush-mounted 23 gauge high strength steel, zinc finish pilaster standards adjustable to 1/2" increments, equal to Knape and Vogt Series 244.
   1. Provide an additional surface mounted Pilaster at all shelves wider than 36", at the middle back of shelf, equal to Knape and Vogt Series 233.
   2. Provide longest possible standards to fit full height of cabinets, using manufacturer's standard lengths.
   3. Provide square, self-adhesive flat top clear rubber pads at glass shelves.
   4. Provide all installation hardware, and support brackets equal to Knape and Vogt 237 series, as required for complete installation. Provide additional support brackets as specified in Part 1 of these specifications.

F. Adjustable Shelf Rests (for pre-drilled holes at cabinet side supports):
   1. 1/4" diameter metal flat top shelf rests, equal to Knape and Vogt 331 series. Mortise bottom side of shelves to match shelf rest shape to prevent sliding.
   2. 1/4" diameter plastic type with shelf retention clip for 3/4" thick shelves, equal to Knape and Vogt 339 series.
   3. Provide additional shelf rests as specified in Part 1 of these specifications.

G. Drawer Slides: Zinc-plated steel drawer slides with steel ball bearings and as follows:
   1. Box Drawer Slides (for drawers less than 7" deep): Side mounted; full-extension type; soft-closing; Medium duty, 100 lb rated equal to Accuride 3832EC.
   2. File Drawer and Deep Storage Drawer Slides: Side mounted; full-extension type; soft-closing; Heavy Duty, 200 lb rated, equal to Accuride 3600EC.

H. Aluminum Slide Assembly for Sliding Glass Doors: Zinc plated steel track with full ball bearing carriers equal to Knape and Vogt "Roll-Ezy Ball Bearing Track", No. P1092 ZC with plunger lock KV No. 984 NP.

I. Grommets for Cable Passage through Countertops: 3-inch OD, color as selected by Architect from manufacturer's full range, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "XG series" by Doug Mockett & Company, Inc.

J. Adjustable Storage Shelving on Standards:
   1. Double slotted heavy duty standards and brackets with titanium finish shall be Knape and Vogt No. E82 and E182, or approved equal.
   2. Shelves shall be 3/4" plastic laminate faced plywood unless otherwise noted.
   3. Attach shelves to brackets with screws.

K. Silencers: 1/16" flat top clear rubber self-adhesive pads. Install two per cabinet drawer or door.

L. Concealed Metal Clips for Wall Panel Installation: Two piece interlocking assembly, similar to a French cleat, designed for removable installation of wall panels without exposed fasteners. System consists of 2 parts with the shorter Z clips mechanically attached to back of panel and the longer continuous length attached to wall substrate.
   1. Manufacturer: Monarch Metal Fabrication; www.monarchmetal.com
   2. Product: Z Clip MF-375; extruded 6063-T6 aluminum; mill finish; 2" clip size; continuous length as required; 3/8" lift-off; 1/4" projection; 2 3/8" total height with two clip sections fully engaged.

2.03 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Rough Carriages for Stairs: No. 1 grade and any of the following species, kiln dried to 15 percent maximum moisture content:
   1. Douglas fir-larch.
   2. Douglas fir-southern.
   3. Hem-fir.
   4. Southern pine.
   5. Spruce-pine-fir.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
   1. Conceal all anchors, or otherwise locate as indicated in Drawings and approved by Architect.

E. Handrail Brackets: Sized to provide minimum of 1-1/2-inch clearance between handrail and wall. Refer to Division 5, Section - Metal Fabrications.

F. Adhesives, General: Adhesives shall not contain urea formaldehyde.

G. Adhesive for Bonding Plastic Laminate: Contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.04 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Cabinet Construction
   1. Exposed Ends: Not less than 3/4" thick plywood, connected to stile with pressure-glued tongue and plow joint and supplemented by special fasteners.
   2. Semi-Exposed Panel Ends: Not less than 3/4" thick plywood.
      a. 3/4" MDF is acceptable where there are no hinges attached to the panel.
   3. Unexposed Ends: Not less than 1/2" thick plywood attached to front frame in same manner as exposed ends.
      a. 3/4" MDF is acceptable where there are no hinges attached to the panel.
   4. Door and Drawer Faces: 3/4" thick plywood.
   5. Back, Top and Bottom Rails: Not less than 3/4" x 3" solid lumber machined to interlock with end panels, and grooved to receive top and bottom panels with back rails secured under pressure with glue and fastening devices.
   6. Shelving: Not less than 3/4" thick plywood banded on front with 3/4" x 1-1/4" hardwood with PVC edge banding unless shown otherwise.
   7. Bottoms: Not less than 3/4" thick plywood fully supported into gains in end panels and grooves in front frame and back bottom rails.
   8. Back Panels: Not less than 1/4" thick, 5-ply veneer core plywood, glued and fastened to machined rear edge of end panels and to top and bottom rails.
      a. At exposed back panels, provide panels equal to those for exposed end panels and exposed surfaces shall match adjacent cabinet body finish.

9. Toe Boards: Not less than 3/8" attached between end panels and extended from bottom panel to floor.
10. Corner Blocks: Wood blocks glued and fastened in each of four top corners to maintain cabinet squareness and rigidity.
11. Casework Doors: 3/4 inch thick plywood. At full height cabinet doors (larger than standard base cabinets), use 1" thick combination core plywood**.**

E. Drawer Construction
1. Drawer Body: Not less than 7/16" plywood sub-front, back and sides, fully dovetailed and glued at all four corners with fronts fastened to sub-front with mounting screws from interior of body.
2. Drawer Bottoms: Not less than 1/4" thick 5-ply veneer core plywood glued into and fully supported by grooves in all four sides of drawer body.

F. Laminate Countertops and Splashes: Constructed from one continuous sheet of laminated plastic without intermediate joints, to the greatest extent possible. Provide cut-outs for sinks and other accessories, cut-out radiuses at least for 1/8 inch with edges filed smooth and free of crazes. Finish edges with PVC edge banding matching color and pattern of plastic laminate.

G. Exposed surfaces shall be machine-sanded to an even, smooth surface, nails set, ready for finishing. All woodwork shall be dry, clean and smooth before any finishing materials are applied. All nail holes, cuts, cracks and other defects shall be treated so as to render them unnoticeable.

H. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

I. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment. Verify cabinet doors and drawers operate freely at inside cabinet corners.

J. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of varnish.
2. Coordinate with actual appliances and equipment to be mounted to cabinets and under countertops, whether such equipment is provided by Contractor or by Owner, and verify unobstructed operation of equipment and of cabinet doors and drawers.

K. Countertops and Splashes:
1. Units fabricated and designed to with-stand a 200 lb. per sq. ft. loading condition without the use of vertical supports. Fabricator shall indicate on shop drawings any special locations for stud supports as required for attachment of countertops.

2. Provide welded steel tube support frames to support countertops at wide spans between base cabinets, walls, or other countertop supports. Conceal steel tubes in adjacent wall, countertop, and cabinet construction to maximum extent possible unless specifically detailed otherwise. Refer to Division 5, Section - Metal Fabrications for general requirements. Provide steel supports as follows:
   a. Where specifically detailed in Drawings.
   b. Where required to achieve loading criteria specified.
3. Junction between countertops and non-integral splashes caulked with clear silicone sealant providing a tight sanitary joint. Junction between splash, countertop or any casework and wall shall be caulked with silicone sealant of color to match wall or adjacent construction.
4. Splash of same construction and countertop, to dimensions indicated on drawings. Provide side splashes at all walls and tall cabinets adjacent to countertops.

L. Install glass to comply with applicable requirements in Division 08 Section - Glazing and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.05 STAIRWORK

A. Finishes for Stair Parts: As follows:
   1. Treads: Transparent.
   2. Risers: Transparent**.**

B. Cut carriages to accurately fit treads and risers. Glue treads to risers, and glue and nail treads and risers to carriages.
   1. House wall stringers and glue and wedge treads and risers.
   2. Fabricate stairs with treads and risers no more than 1/8 inch from indicated position and no more than 1/16 inch out of position for adjacent treads and risers.

2.06 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Panel Products for Exposed Surfaces:
   1. Doors and Drawer Fronts: Plywood.
   2. Other Surfaces with screw attachments for hinges: Plywood.
   3. Other Surfaces without screw attachments for hinges: Medium Density Fiberboard, unless otherwise indicated.

D. Laminate Cladding for Exposed Surfaces: Exposed portions of cabinets include all surfaces, including edges, visible when doors and drawers are closed. Visible surfaces in open cabinets and shelving units are also to be considered exposed surfaces. All exposed surfaces to receive high-pressure decorative laminate complying with laminate grade requirements of the specified cabinet grade.
   1. Edges of Cabinet Panels, Doors, and Drawers: PVC edge banding, matching laminate in color, pattern, and finish
   2. Edges of Plastic-Laminate Shelves: 3/4"x1-1/2" stiffener at front side of shelf, with PVC edge banding, matching laminate in color, pattern, and finish

E. Materials for Semi-exposed Surfaces: Semi-exposed portions of cabinets include surfaces behind opaque doors and drawer fronts including shelves, dividers, interior faces of cabinet ends, backs, tops and bottoms, and drawer sides, backs and bottoms. Also, included are underside bottoms of cabinets over 2'-0" from floor and tops 5'-9" or more above floor.
   1. Surfaces Other Than Drawer Bodies: Hardwood plywood with clear UV finish.
   2. Drawer Sides and Backs: Hardwood plywood with clear UV finish.

3. Drawer Bottoms: Hardwood plywood with clear UV finish.

F. Laminate Colors, Patterns, and Finishes: As scheduled in Drawings.

2.07 PLASTIC-LAMINATE COUNTERTOPS

A. High-Pressure Decorative Laminate Grade HGS.

B. Colors, Patterns, and Finishes: As scheduled in Drawings.

C. Edge Treatment:
   1. Material: PVC edge banding, matching laminate in color, pattern, and finish.

D. Core Material at splashes: Medium-density fiberboard. Countertops with sinks shall have Exterior-grade MDO plywood.

E. Core Material at countertops:
   1. Countertops without sinks: Medium-density fiberboard.
   2. Core Material at countertops with sinks: Exterior-grade MDO plywood.

F. Backer Sheet: Provide melamine balancing sheet on underside of countertop substrate.

2.08 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with balancing sheet.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing materials and backpriming.

3.02 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Where exposed fastening is unavoidable, use fine finishing nails, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless approved by Architect.
   1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

H. Stairs: Securely anchor carriages to supporting substrates. Install stairs with treads and risers no more than 1/8 inch from indicated position.

I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
   4. Caulk space between backsplash and wall with sealant specified in Division 07 Section - Joint Sealants.

K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

L. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold-applied, emulsified-asphalt dampproofing.
      a. At concrete planter beds, with free draining aggregate and weeps.

B. Related Sections include the following:
   1. Division 03 Section - Cast-in-place Concrete.
   2. Division 31 and 33 Sections for filter fabric, free draining aggregate and PVC weeps.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.

B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

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. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
   2. ChemMasters, Inc.
   3. Euclid Chemical Company (The); an RPM company.
   4. Henry Company.
   5. Karnak Corporation.
   6. Koppers Inc.
   7. Malarkey Roofing Products.
   8. Meadows, W. R., Inc.

B. Basis of Design shall be a heavy bodied, non-sag coating with short fibers for application with Fibered Brush, Roller or Spray, in compliance with ASTM D-1227, Type II, Class 1, equal to BASF's "MasterSeal 615".

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

D. Patching Compound: Asbestos-free fibered mastic of type recommended in writing by dampproofing manufacturer.

E. Protection Course at grade beams below grade: ASTM D 6506, 1/8-inch- thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

F. Protection Course at retaining walls: Smooth-surfaced roll roofing complying with ASTM D 6380, Class S, Type III.

2.04 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Division 33 Section - Subdrainage.

B. Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a 40% post-industrial recycled polypropylene drainage core of fused, entangled filaments, with a geocomposite fabric facing bonded to one side with an opening size not exceeding No. 70 sieve, and a vertical flow rate of 9 to 22 gpm per ft. Provide termination bar and sheet metal flashing cap for panels installed with top edge above grade. The Basis of Design product shall be "Enkadrain 3611R", as manufactured by Colband Inc., Enka, NC (800) 365-7391.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
   1. Apply dampproofing to provide continuous plane of protection.
   2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete: Apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or one trowel coat at not less than 4 gal./100 sq. ft.

3.05 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
   1. Install protection course within 24 hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.06 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
   1. Install protection course before installing drainage panels.

3.07 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 11 13

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide all building insulation as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 06 Section - Wood Framing, for coordination with framing for packing cavities with Batt insulation.
   2. Division 06 Section - Sheathing.
   3. Division 07 Section - Air Barriers.
   4. Division 09 Section - Gypsum Board Assemblies.
   5. Division 09 Section - Acoustic Insulation.
   6. Division 21 and 23 Sections, for piping and mechanical ductwork insulation.

1.03 QUALITY ASSURANCE

A. Design Criteria:
   1. Thermal Resistance: R-Value designations indicated in accordance with ASTM C-518 is the thermal resistance of the insulation only.
   2. Fire Resistance: Material shall have a Class B fire rating less than 75 as tested by ASTM E-84.

B. Paper faced batt insulation shall not be used. Foil-faced insulation shall not be used except as specifically prescribed herein.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original packages, clearly marked with brand name, type and R-Value.

B. Store materials in area protected from weather, moisture and damage, remove any damaged materials from the site.

1.05 SUBMITTALS

A. Samples of materials and complete product literature (with documented R-Values) submitted for approval to the Architect prior to ordering materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, Manufacturer’s offering Products which may be incorporated into the work include the following:
   1. CertainTeed Corporation, Valley Forge, PA. (215) 341-7000.
   2. Owens-Corning Fiberglass Corporation, Toledo, OH. (419) 248-8000.
   3. Schuller International, Insulation Division, Denver, CO. (800) 654-3103.
   4. Johns Manville, Denver, CO.

5. Knauf Insulation, Shelbyville, IN.
6. Dow Chemical Company, Midland, MI.
7. ROXUL, Inc., Milton, Ontario

B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.02 MATERIALS

A. Glass Fiber Batt Insulation: Unfaced with flame spread of 25 minutes in compliance with ASTM C665, Type III, Class A and ASTM 136.
   1. Provide at 2 x 8 stud construction in exterior walls and between conditioned and unconditioned spaces, unless otherwise noted: Nominal 5 1/2" thick batt insulation with an R-value of 21.
   2. Provide at shop fabricated wood truss construction, at bottom cord of truss, between conditioned and unconditioned spaces, unless otherwise noted: Nominal 12" thick batt insulation with an R-value of 38.

2.03 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates. Adhesive shall be compatible with air barrier membrane.

B. Provide insulation fasteners as recommended by manufacturer for substrates and conditions indicated.

PART 3 - EXECUTION

3.01 INSPECTION AND COORDINATION

A. Examine areas receiving insulation work to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from mortar droppings, grease, oil or other debris which would affect proper insulation. Application constitutes acceptance of substrate conditions.

B. Coordinate marking centerline of studs on exterior face of continuous insulation as required for insulation installation and for subsequent fastener installation by other trades.

3.02 GENERAL INSTALLATION

A. Prepare surfaces using methods recommended by manufacturer for achieving the best result for the substrate under the project conditions.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Insulation installed in accordance with current printed recommendations of insulation manufacturer as specified.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

F. Install batt insulation without visible voids, gaps or separations. Place insulation in Cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members. Cut and trim insulation neatly to fit spaces without laps, bulges or folds. Use batts free of rips and tears.

G. Fit insulation tight within spaces and tight to and behind mechanical and electrical wiring.

3.03 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install batt insulation in cavities formed by framing members according to the following requirements:
   1. Use insulation 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.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. For stud-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically.
   4. Fill roof expansion joints with batt insulation to equal or greater R-value of insulation at roof surface.

3.04 FIELD QUALITY CONTROL

A. Comply with requirements of Authorities having jurisdiction for inspection of installation of insulation, and with requirements of commissioning agent. Notify respective parties and schedule required inspections prior to closing walls or cavities containing thermal insulation.

3.05 CLEANING

A. Comply with requirements of Division 01, Section "Construction Waste Management".

END OF SECTION 07 21 00

SECTION 07 26 00 - VAPOR BARRIER MEMBRANE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
   1. Vapor barrier film beneath slabs on grade.

B. Related Sections:
   1. Division 03 Section - Cast-in-Place Concrete.
   2. Division 31 Section - Earthwork.

1.03 COORDINATION

A. Coordinate installation with scheduled concrete pours to avoid delays. Make provision for installation of work by other trades.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 1745- 11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E 154- 08 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   3. ASTM F 1249-06 (2011) Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   4. ASTM D 882-10 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   5. ASTM D 1709-09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
   6. ASTM E 1643- 11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.05 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Procedures for submittals.

B. Quality Control / Assurance:
   1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair.

C. Provide 12" x 12" samples of vapor barrier material and samples of tape for joints.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Basis of Design: Stego Industries LLC (281) 367-0040 www.stegoindustries.com.
   2. Raven Industries (800) 635-3456 www.ravenefd.com.
   3. Reef Industries (713) 507-4250 www.reefindustries.com.

B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Not Permitted

2.02 MATERIALS

A. Membrane Film:
   1. Qualities:
      a. Maintain a permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)], as tested in accordance ASTM E-154, with mandatory conditioning tests, per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
      b. Strength: ASTM E 1745 Class A.
      c. Thickness: 15mils minimum, in accordance with ACI 302.2R-06.
      d. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
   2. Available products:
      a. Basis of Design: Stego Wrap Vapor Barrier (15 mil) by Stego Industries.
      b. Vapor Block (15 mil) by Raven Industries.
      c. Griffolyn (15 mil) by Reef Industries.
      d. No Substitutions.

B. Accessories:
   1. Seams Tape: Stego Tape by Stego Industries LLC, or membrane manufacturer's standard tape for applications indicated.
   2. Penetration Repair: Stego Mastic and Stego Tape by Stego Industries LLC, or membrane manufacturer's standard product for applications indicated.
   3. Perimeter / Edge Seal: Crete Claw, Stego Tack Tape and Stego Term Bar by Stego Industries LLC, or membrane manufacturer's standard product for applications indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not proceed until fill is level and without voids, and plumbing and electrical rough-ins are complete.

3.02 INSTALLATION - GENERAL

A. Install Vapor Barrier in accordance with ASTM E 1643-11:
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
   2. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
   3. Seal vapor barrier to slab perimeter/edge using Stego Crete Claw and remove dirt, debris, and mud from Crete Claw prior to concrete placement.

4. Alternate: Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
5. Overlap joints 6 inches and seal with manufacturer’s tape.
6. Apply tape/Crete Claw to a clean and dry vapor barrier.
7. Seal all penetrations (including pipes) per manufacturer’s instructions.
8. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
9. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

3.03 PROTECTION

A. Protect completed membrane from damage. Prior to pouring concrete, inspect membrane for punctures or damage and repair as required.
   1. At crawl space applications, inspect membrane for damage prior to substantial completion. Repair damaged areas per membrane manufacturer's instructions.

END OF SECTION 07 26 00

SECTION 07 27 13 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work of this section includes, but is not limited to, the following:
   1. Materials and installation methods for self-adhering, vapor-retarding, modified bituminous sheet air barriers located in the non-accessible part of the wall applied to the following surfaces:
      a. Exterior face of exterior sheathing in locations above adjacent roof surfaces and as shown in Drawings.
      b. Flashing membranes for sealing adjacent air and weather barrier system(s), as required to provide a continuous weather-tight installation.

B. Related Sections include the following:
   1. Division 04 Section - Manufactured Stone.
   2. Division 06 Section - Rough Carpentry.
   3. Division 06 Section - Wood Framing
   4. Division 06 Section - Sheathing.
   5. Division 07 Section - Flashing and Sheet Metal for sheet metal flashings.
   6. Division 07 Section - Joint Sealants for joint-sealant materials and installation.
   7. Division 09 Section - Gypsum Board Assemblies for exterior gypsum sheathing.
   8. Division 09 Section - Stucco.

1.03 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide an air and vapor barrier system to perform as a continuous vapor-retarding air barrier, and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration. Air barriers shall be capable of accommodating substrate movement and sealing of substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Barrier Assembly Air Leakage: Not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/s/m2 @ 75 Pa.).

C. Temperature: Provide “High Temperature” (HT) rated product.

1.05 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s product data, installation instructions, use limitations and substrate preparation recommendations for each applicable substrate.

B. Shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
   1. Include details of interfaces with other materials that form part of the complete building air barrier or weather barrier system.

C. Written documentation demonstrating installers' qualifications under the "Quality Assurance" article including reference projects of a similar scope.

D. Samples: Submit representative samples of the following for approval:
   1. Self-Adhered Air Barrier Membrane
   2. Self-Adhered Transition Membrane

1.06 INFORMATIONAL SUBMITTALS

A. Written documentation demonstrating installers' qualifications under the "Quality Assurance" article including reference projects of a similar scope.

B. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with air barrier; signed by product manufacturer.

C. Warranty: Submit a sample Warranty identifying the terms and conditions.

1.07 QUALITY ASSURANCE

A. Manufacturer: Air and vapor barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barrier products. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
   1. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
   2. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.

C. Materials: Self-adhered air and vapor barrier material shall be 40 mil (.004 in) comprising 36 mil (.0036 in.) rubberized asphalt integrally bonded to 4 mil (.0004 in.) cross-laminated polyethylene film, rated for high temperature installation (HT). For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings, including connection details with other air and weather barrier systems.
   4. Sequence of construction, responsibilities and schedule for subsequent operations.
   5. Review of mock-up requirements.
   6. Review of inspection, testing, protection and repair procedures.

E. Mock-up:

1. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be provided under the provisions of Division 1 Section - Submittals, Product Data, Samples and Mock-ups, to verify details & tie-ins, and to demonstrate the required quality of materials and installation.
2. Construct a typical exterior wall section, 6 feet long and 6 feet wide minimum, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (foundation, inside and outside corners, etc).
3. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.

F. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of membrane components. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist. Barrier must be covered with exterior material within 30 days of installation or be replaced.

B. Coordinate air barrier installation to avoid excessive exposure to ultraviolet rays and other damage. Barrier must be covered with exterior material or protected in accordance with Manufacturer's requirements within Manufacturer's exposure time limitations or be replaced.

PART 2 - PRODUCTS

2.01 SELF-ADHERED AIR BARRIER MEMBRANE

A. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

B. Minimum Performance Requirements:

Property	Test Method	Typical Value
Thickness	ASTM D 3767 Method A	1.0 mm (0.040 in.) nominal
Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2178	<0.001 L/(s.m^2) (<0.0002 cfm/ft^2)
Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2357	<0.004 L/s*m^2 (<0.0008 cfm/ft^2)
Water Vapor Permeance	ASTM E 96, Method B	Less than 2.9 ng/Pa.s.m^2 (0.05 Perms)

Water Absorption: -	ASTM D 570	Max. 0.1% by weight
Puncture Resistance	ASTM E 154	178 N (40 lbs.)
Tear Resistance	Initiation - ASTM D 1004 Propagation - ASTM D1938	Min. 58 N (7.0 lbs.) M.D. Min. 40 N (4.0 lbs.) M.D.
Lap Adhesion at -4°C (25°F)	ASTM D 1876	880 N/m (5.0 lbs./in.) of width
Low Temperature Flexibility	ASTM D 1970	Unaffected to -43°C (-45°F)
Tensile Strength	ASTM D 412, Die C Modified	Min. 2.7 MPa (400 psi)
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 - Die C	Min. 200%

C. Air barrier applied to wall at all walls above adjacent lower roofs and where indicated: Basis of Design Product: Grace Construction Products: Perm-A-Barrier® High Temperature (HT) Wall Membrane. Subject to compliance with requirements, provide the named product, or approved equal system by another manufacturer.
   1. For In-Service Temperatures up to at least 180 degree F, including accessories.

D. Substitutions: Permitted, with proof of equal performance characteristics. Submit comparison data for basis of design and proposed alternate products, and manufacturer's certification of equal performance characteristics.

2.02 TRANSITION MEMBRANE

A. Description: Min. 1 mm (.040 in / 40 mil) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

B. Performance Requirements:
   1. Water Vapor Transmission: ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m^2) (0.00012 cfm/ft^2) max.
   3. Puncture Resistance: ASTM E 154: 178 N (40 lbs.) min.
   4. Lap Adhesion at -4°C (25°F), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width min.
   5. Low Temperature Flexibility, ASTM D 1970: Unaffected to -43°C (-45°F).
   6. Tensile Strength, ASTM D 412, Die C Modified: min. 2.7 MPa (400 psi)
   7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: min. 200%

C. Materials:
   1. Perm-A-Barrier High Temperature Detail Membrane manufactured by Grace Construction Products, or approved equal by other approved air barrier manufacturer.
      a. In-Service Temperature Range: Meet or exceed the requirements for self-adhered membrane.

2.03 AIR & VAPOR BARRIER ACCESSORIES

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Termination Bar: Air barrier manufacturer's recommended termination bar for applications indicated.

C. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

D. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

E. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section - Joint Sealants.

F. Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
   1. Flash Point: No flash to boiling point
   2. Solvent Type: Water
   3. VOC Content: Not to exceed 10 g/l
   4. Application Temperature: -4°C (25°F) and above
   5. Freezing point (as packaged): -7°C (21°F)
   6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.

G. Sealant: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
   1. Product: Bituthene® Liquid Membrane manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.

H. Optional Primers:
   1. Description: High tack water based primer. 10 g/l max. VOC content.
      a. Product: Perm-A-Barrier Liquid Part B manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
   2. Description: High tack low VOC solvent based primer. <200 g/l max. VOC content.
      a. Product: Bituthene Primer B2 LVC manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
   3. Description: High tack solvent based primer. 440 g/l max. VOC content.
      a. Product: Bituthene Primer B2 manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Fill and treat joints according to membrane manufacturer's recommendations for each substrate indicated, and per manufacturer's recommendations to prevent excessive outward building pressures from being exerted on the membrane.
2. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
3. Prime substrates according to membrane manufacturer's requirements for each substrate material indicated.

D. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

G. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufacturer's written instructions.

3.03 INSTALLATION

A. Refer to membrane manufacturer’s literature for recommendations on installation

B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

C. Application of Self-Adhered Air Barrier Membrane
1. Install air & vapor barrier to dry surfaces at air and surface temperatures of 40°F and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
2. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
3. Precut pieces of air & vapor barrier into easily handled lengths.
4. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
5. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
6. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
7. Overlap horizontally adjacent pieces 50 mm (2 in.) and roll seams.
8. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.
9. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
10. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
11. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
12. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
13. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

14. Do not expose air & vapor barrier membrane to sunlight for more than thirty days prior to enclosure.
15. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.

D. Application of Transition Membrane
1. Prime substrate to receive transition membrane as required per manufacturers written instructions.
2. Apply transition membrane with a minimum overlap of 75mm (3 in.) onto each surface at all beams, columns and joints as indicated in detail drawings.
3. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
4. Use pre-cut, easily handled lengths for each location.
5. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
6. When properly positioned, place against surface by pressing firmly into place by hand roller.
7. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
8. Seal top edge of flashing with termination mastic.
9. When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 60 mils (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm (3 in.) onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.

E. Termination Bars: Install termination bars as applicable according to manufacturer's recommendations. Install termination bars where recommended by the manufacturer, and where specifically detailed in the Drawings.

3.04 PROTECTION AND CLEANING

A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by the manufacturer of affected construction.

B. Protect the air barrier from damage and wear during remainder of construction period. Repair damage according to manufacturer's instructions.

C. Wall Membranes are not suitable for permanent exposure and should be protected from the effects of sunlight. Maximum sun exposure is limited to 30 days. Schedule work to ensure that the Wall Membrane system is covered as soon as possible after installation. Protect the Wall Membrane system from damage during subsequent operations. If the Wall Membrane system cannot be covered within 30 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION 07 27 13

SECTION 07 27 19 - PLASTIC FILM AIR BARRIER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Air and moisture barrier building wrap, at exterior walls and where detailed in drawings.

B. Related Sections include the following:
   1. Division 04 Sections - Manufactured Stone.
   2. Division 06 Section - Sheathing.
   3. Division 07 Section - Bituminous Damp-Proofing.
   4. Division 07, other “Air Barrier” or “Weather Barrier” Sections, for coordination of materials and details at junctures of different weatherization systems.
   5. Division 07 Section - Self Adhering Sheet Air Barrier.
   6. Division 09 Section - Stucco Plaster.

1.03 PERFORMANCE REQUIREMENTS

A. ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450 respectively, when tested in accordance with ASTM E 84.

B. ASTM D882; Test method for tensile properties of thin plastic sheeting.

C. Water Vapor Permeance: Not less than 350 g/sq. m in 24 hours (20 perms) per ASTM E 96.

1.04 SUBMITTALS

A. Product Data for each type of product specified.
   1. Submit manufacturer’s standard product literature.

B. Quality Assurance/Control Submittals:
   1. Certificates: Manufacturer's certificate or test data that Products meet or exceed specified requirements.
   2. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.
   3. Submit manufacturer’s written installation instructions.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

B. Source Limitations: Provide all commercial grade materials. Provide all materials from a single manufacturer, or as recommended by the air barrier manufacturer for use with their system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store and protect materials during construction keeping dry and away from open flame or sparks in compliance with manufacturer's recommendations.

1.07 SCHEDULING AND COORDINATION

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 air-barrier materials and exterior cladding within nine months of weather barrier assembly installation, or manufacturer's requirement, whichever is more stringent.

C. Coordinate with other air barrier and waterproofing systems specified. Provide membrane flashing and other joint materials as required for compatible joint conditions with adjacent systems, and to provide a continuous weatherization system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include, but are not limited to the following:
   1. DuPont Tyvek Stucco Wrap, for use behind portland-cement based plaster systems and synthetic stone veneer cladding systems.
   2. DuPont Tyvek Commercial Wrap, for use behind Portland-cement based plaster systems and synthetic stone veneer cladding systems.

2.02 ACCESSORIES

A. Seam Tape: Minimum 3 inch wide, pressure sensitive tape with approved adhesive, as recommended by the air-moisture barrier manufacturer for commercial applications.

B. Building Wrap Fasteners: Plastic disk fastener-caps with screws, of type and spacing as approved by weather barrier manufacturer for application to substrate. No staples allowed.

C. Building Wrap Sealants: Acrylic or polyurethane sealant as approved by air-barrier manufacturer for applications indicated. Refer to Division 07 Section - Sealants for compliance with exterior-grade sealants.

D. Adhesives: Use only adhesives recommended by weather barrier manufacturer.

E. Primers: Provide primer to assist in adhesion between substrate and flashing, as recommended by flashing manufacturer.

F. Membrane Flashings:
   1. Provide self adhering membrane flashings as recommended by air-barrier manufacturer for applicable flashing conditions, opening types, and masonry veneer ties and anchors.
   2. DuPont StraightFlash and FlexWrap.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required by manufacturer, dry, free of loose materials, and ready to receive air-barrier installation.

B. By beginning installation, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Remove existing air and weather barriers, flashings, carrier or protective films and similar materials that would impede adhesion from substrates indicated to receive elasticized flexible flashing tape. Clean surfaces thoroughly prior to installation in compliance with air-barrier manufacturer's recommendations.

3.03 INSTALLATION

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install air barrier sheets and assembly materials to form a seal with adjacent construction and to maintain a continuous air barrier.

C. Connect and seal building sheet air barrier membrane continuously to exterior window and door openings, construction transitions and other penetrations in exterior wall openings using self-adhering flexible flashing.
   1. Apply self-adhering flexible flashing so that a minimum of 3 inches of coverage is achieved over adjacent substrates.

D. Openings and Penetrations: Provide straight and flexible flashings for openings as required to provide weather-tight barrier. Install lapped components to direct water to exterior of building.
   1. 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. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten all fish-mouths and blisters. Patch with air barrier sheet extending 6 inches beyond repaired areas in all directions shingled in proper lapped condition to direct water to exterior cavity.

F. Correct deficiencies in or remove air barrier membrane that does not comply with requirements; repair substrates and reapply air barrier components.

G. Install weather barrier prior to installation of windows and doors.

H. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

I. 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.

J. Window and Door Openings: Extend weather barrier completely over openings.

K. Overlap weather barrier
   1. Exterior corners: minimum 12 inches.
   2. Seams: minimum 6 inches.

L. Weather Barrier Attachment:

1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

M. Apply membrane flashing to weather barrier membrane as recommended by manufacturer prior to the installation of cladding anchors.

N. Seal face of wall to storefront jamb with flashing membrane. Turn to exterior and lap 3".

3.04 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts.

3.05 OPENING PREPARATION (FOR USE WITH NON-FLANGED WINDOWS)

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.

3.06 FLASHING (FOR USE WITH NON-FLANGED WINDOWS)

A. Cut sill flashing membrane a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning sill flashing membrane 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 sill flashing membrane at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. Apply 9-inch wide strips of flashing membrane at jambs. Align flashing membrane with interior edge of jamb framing. Start flashing membrane at head of opening and lap sill flashing membrane down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install sill flashing membrane at opening head using same installation procedures used at sill. Overlap jamb flashing membrane a minimum of 2 inches.

G. Coordinate flashing with window, door, and louver installation.

H. On exterior, install backer-rod in joint between window door or louver 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 flashing membrane or type as recommended by weather barrier manufacturer over the 45-degree seams.

J. Tape top of window in accordance with weather barrier manufacturer’s recommendations.

K. Seal interior side of opening as required.

L. Where jambs in cavity wall construction are detailed with stainless steel flashings, seal flashings to wall with self-adhering membrane flashings.

3.07 PROTECTION

A. Protect air barrier system from sparks, open flames and damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 180 days.

B. Protect air barrier from contact with solvents, coatings, mastic or sealants not approved by air barrier manufacturer

C. Inspect for damage just prior to installation of exterior finish materials and promptly repair damaged conditions.

END OF SECTION 07 27 19

SECTION 07 31 13 - SHINGLE ROOFING & FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide fiberglass reinforced asphalt shingle roofing as described in this section of the specifications and / or as shown on the drawings.

B. Related Documents: The Contract Documents, as defined in Division 01 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections include the following:
   1. Division 06 Section - Sheathing.
   2. Division 07 Section - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
   1. ASTM - American Society for Testing and Materials, Philadelphia, PA.
   2. FM - Factory Mutual Engineering and Research, Norwood, MA.
   3. NRCA - National Roofing Contractors Association, Rosemont, IL.
   4. OSHA - Occupational Safety and Health Administration, Washington, DC.
   5. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
   6. UL - Underwriters Laboratories, Northbook. IL

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane underlayment and shingles shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Shingle roofing and flashings shall be installed in accordance with NRCA Roofing Manual: Steep-slope Roof Systems, and shall remain watertight.

B. Testing Requirements: The roof system shall be tested in compliance with local code requirements and as follows:
   1. Wind Resistance: The roof system shall be tested in compliance with ASTM D 7158, and with classification F per ASTM D 3161.
      a. In high wind applications underlayments shall comply with additional requirements as required per local codes.
   2. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.

C. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

D. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations.
   1. Follow all industry, code, fire prevention guidelines and requirements for storage of materials, staging areas, roof access, and application means and methods.

1.05 QUALITY ASSURANCE

A. Acceptable manufacturers: Minimum of Five years in manufacture of Fiberglass shingles.

B. Underwriters' Laboratories Label:
   1. Fiberglass Reinforced Asphalt Shingles: Class-A fire resistance rating.

C. Install shingles to meet requirements of manufacturer's instructions.

1.06 SUBMITTALS

A. Manufacturer's Literature: Material description and recommended installation procedures.

B. Samples:
   1. Shingles: Two of each style selected indicating full range of colors.
   2. Accessories: Two of each item of finish specified.

1.07 PRODUCT DELIVERY, STORAGE & HANDLING

A. Deliver materials with manufacturer's labels intact and legible.

B. Deliver materials in sealed packages with Underwriters' Laboratories, Inc. labels.

C. Store materials on raised platforms and protect with coverings at outdoor locations, at no more than 110 degrees F.

D. Do not stack bundles of shingles more than 4 ft. high.

E. Store rolled goods on end.

1.08 JOB CONDITIONS

A. Do not install underlayment or shingles on wet surfaces.

B. Do not apply shingles when air temperature is below 40 degrees F.

1.09 WARRANTY

A. Shingle Roof: Provide manufacturer's Limited Material Warranty for a minimum period of 25 years on shingle roof.

PART 2 - PRODUCTS

2.01 SHINGLES

A. Self sealing, granule surfaced, asphalt shingle with a strong fiberglass reinforced Micro Weave core and StainGuard protection, which prevents pronounced discoloration from blue-green algae through formulation/unique blends of granules. Architectural laminate styling with a wood shake appearance with a 5 5/8in. exposure. UL 790 Class A rated with UL 997 Wind Resistance Label; ASTM D 7158, Class H; ASTM D 3161, Type 1; ASTM D 3018, Type 1; ASTM D 3462; AC438 compliant; CSA 123.5-98; Dade County Approved, Florida Building Code Approved, Texas Dept of Insurance Approved, ICC Report Approval. **Timberline HD®** Lifetime High Definition Shingles, by GAF.

1. Color: As selected from manufacturer's full range

2.02 HIP AND RIDGE SHINGLES

A. High profile self sealing hip and ridge cap shingle matching the color of selected roof shingle. **Timbertex®** Premium Ridge Cap Shingles, by GAF

2.03 STARTER STRIP

A. Self sealing starter shingle designed for premium roof shingles. **WeatherBlocker™** Eave/Rake Starter Strip by GAF.

2.04 ROOFING UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.05 NAILS

A. Hot galvanized aluminum 11 or 12 ga. barbed shank, 3/8" head, sharp pointed conventional, of sufficient length to penetrate through plywood sheathing. Staples shall not be used.

2.06 ASPHALT PLASTIC CEMENT

A. ASTM D 4586, Type 1.

2.07 ALUMINUM ACCESSORIES

A. Provide .020" thick aluminum flashing and drip edge; pre-finish where exposed with baked on acrylic color coating, color selected by the Architect.

2.08 VENTS

A. Ridge Vent: Polypropylene, baffled vent with 18 square inches/linear foot, equal to "Cobra Ridge Vent 3" by GAF Materials Corp.

PART 3 - EXECUTION

3.01 INSTALLATION OF SHINGLE ROOF

A. Self-adhering Underlayment:
   1. Install under entire roof.
   2. Install per manufacturer's instructions.

B. Flashings, Vents and Metal Drip Edge:
   1. Eaves and Rake Flashing: Nail metal drip edge along the bottom edge (eaves) before felt is laid and to the sides (rakes) after the felt is laid.
   2. Vent Pipes:

a. Apply shingles up to vent pipe and cut hole in next shingle to go over pipe. Set the shingle in black plastic cement.
b. A flashing flange of mineral surfaced roofing or metal is cut and placed over shingle and vent pipe, set in black plastic cement.
c. Rest of shingles are then cut around pipe and all are set in black plastic cement.

3. Ridge Vents: Secure to roof sheathing at ridge continuously and overlay with shingles as per manufacturer's installation instructions. Vent to match size and profile of existing.

C. Installation of Starter Shingles:
1. Install in accordance with GAF®'s instructions and local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
2. Refer to application instructions for the selected starter strip shingles.
3. For maximum wind resistance along rakes & eaves, install any GAF® starter strip containing sealant or cement shingles to underlayment and each other in a 4" (102mm) width of asphalt plastic roof cement.
4. Place starter strip shingles 1/4" – 3/4" (6 – 19mm) over eave and rake edges to provide drip edge.
5. Nail approximately 1-1/2" – 3" (38 – 76mm) above the butt edge of the shingle.
6. Rake starter course should overlap eave edge starter strip at least 3" (76mm).

D. Installation of Shingles:
1. Install in accordance with GAF®'s instructions and local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
2. Minimize breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F (4 degrees C).
3. Handle carefully in hot weather to avoid scuffing the surfacing, or damaging the shingle edges.
4. Secure with 4, 5, or 6 nails per shingle per GAF®'s application instructions or local codes.
5. Placement of nails varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.
6. Nails must be driven flush with the shingle surface. Do not overdrive or under drive the nails.
7. Shingle offset varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.
8. Install valleys using the "closed cut valley" method:
a. Run the first course of shingles from the higher roof slope across the valley at least 12 inches (305mm).
b. Run succeeding courses of shingles from the lower roof slope across the valley at least 12 inches (305mm) and nail not closer than 6 inches (152mm) to center of valley.
c. Run shingles from the upper roof slope into the valley and trim 2 inches (51mm) from the center line.
9. All Penetrations are to be flashed according to GAF®, ARMA and NRCA application instructions and construction details.

3.02 PROTECTION

A. Protect installed products from foot traffic until completion of the project.

B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.

END OF SECTION 07 31 13

SECTION 07 40 00 - METAL ROOF AND WALL PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Work includes all labor, materials, equipment and services necessary for fabrication and installation and/or replacement of metal wall panels, aluminum battens and metal patches as shown on drawings and as herein specified.

B. Related Sections include the following:
   1. Division 06 Section - Sheathing.
   2. Division 07 Section - Sheet Metal Flashing and Trim.
   3. Division 07 Section - Roof Specialties.
   4. Division 07 Section - Roof Accessories.
   5. Division 07 Section - Joint Sealers.
   6. Division 09 Section - Painting.

1.03 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
   1. ASTM - American Society for Testing and Materials, Philadelphia, PA.
   2. FM - Factory Mutual Engineering and Research, Norwood, MA.
   3. NRCA - National Roofing Contractors Association, Rosemont, IL.
   4. OSHA - Occupational Safety and Health Administration, Washington, DC.
   5. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
   6. UL - Underwriters Laboratories, Northbook. IL

1.04 QUALITY ASSURANCE

A. Fabricator and erector shall demonstrate experience of a minimum of five years of related industry experience.

B. Design Criteria: Engineering panels for structural properties in accordance with the latest edition of the American Iron and Steel Institute "Cold Formed Steel Design Manual", using "effective width" concepts.

C. Metal Shapes Design Criteria: Conform to latest edition of Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

D. Preliminary Roofing Conference: Before starting roof construction, conduct conference at Project site.
   1. Review structural loading limitations of deck and structural members during and after roofing.
   2. Review flashings including all penetration details, special details, drainage, penetrations, and condition of other construction that affect metal panels.

3. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
4. Review temporary protection requirements for metal panel systems during and after installation.
5. Review procedures for repair of metal panels damaged after installation.

1.05 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

B. Testing Requirements: The roof system shall be tested in compliance with local code requirements and as follows:
1. Wind Resistance: The system shall be tested to comply with FM4474. Through-fastened roof panel systems tested in compliance with UL 580 or UL 1897. Standing seam attached systems tested in compliance with UL 580 or ASTM E 1592.
2. Physical Weathering Properties: The system shall be tested to demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G154, or ASTM G155.
   a. Corrosion Resistance: Metal panels shall have corrosion resistance in accordance with local code requirements for the materials indicated.
3. Impact Resistance: The system shall be tested to resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M, or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470.
4. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.

C. Structural Performance: Provide roof panels systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As required by code and indicated wind rating, whichever is greater.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240.

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 90.

E. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A- 120.
2. Hail Resistance: MH.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

G. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations.

1. Follow all industry, code, fire prevention guidelines and requirements for storage of materials, staging areas, roof access, and application means and methods.

1.06 SUBMITTALS

A. Product data and shop drawings based on the Contract Documents and field conditions of each metal panel type, profile and trim configuration to be replaced and/or installed.

B. Samples:
   1. Submit six inch long samples of each metal wall component and trim.
   2. Submit samples of each type of sealant.

C. Shop drawings showing profile and gauge of sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim, location and type of sealants, and any other details as may be required for a weathertight installation. Indicate field and factory applied sealant.

D. Documentation and testing reports demonstrating that roof panels meet the specified wind loads. Uplift calculations shall be sealed by a professional engineer licensed in the State of Texas.

E. Informational Submittal: Letter from Manufacturer stating acceptance of proposed underlayment for use with their products and for specified special warranty.

1.07 STORAGE AND HANDLING

A. Panels should be stored on edge in a clean dry place. One end should be slightly elevated to allow moisture to run off rather than accumulate on the faces.

B. Panels with strippable plastic film must not be stored in the open, exposed to the sun.

C. Stack pre-formed and prefinished material to prevent twisting, bending, or abrasion and to provide ventilation.

D. Prevent contact with materials during storage which may cause discoloration or staining.

E. In handling prefinished panels, lift up panels and do not slide panels when un-stacking.

1.08 FIELD CONDITIONS AND COORDINATION

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Coordinate sizes and locations of roof curbs, equipment supports, and other roof penetrations with actual equipment to be provided.

C. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Provide manufacturer's standard twenty (20) year warranty stating architectural fluorocarbon finish will be:
   1. Free of fading of color change in excess of 6 NBS units as measured per ASTM D 2244-68;
   2. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;
   3. Will not peel, crack, chip, or de-laminate.

B. Furnish written warranty signed by applicator for two year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight conditions.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Roofing Panels: 24 Gauge, 16" x 2" smooth striated face, interlocking, Galvalume steel panel with concealed fastening system and high grade hot melt elastomeric sealant to seal adjoining panel legs. Fascia and gutter shall be pre-formed, custom design as shown on drawings, fabricated of same material as panel. Panel shall be one of the following or other approved equal:
   1. MBCI "BattenLok HS", or approved equal.
   2. Berridge "Double-Lock Zee-Lock" standing seam metal roofing panels.
   3. The Garland Company, Inc. “R-Mer Shield” standing seam metal roofing panels.

B. Roof Panel Finish: 70% PVDF flouropolymer resin coating in color as selected by Architect from Manufacturer's full range (including metallic options)

C. Ridge Vents: Provide continuous vents at ridges with a minimum net free ventilating area of 13.5 square inches per linear foot.
   1. Plastic Insert: Cor-A-Vent Model V300/CS or equal.

D. Anchoring Devices: Provide spacers, fasteners, clips, angles and other devices necessary to install metal panels.

E. Accessory Materials:
   1. Panel Fasteners: Galvanized steel with washers where required.
   2. Sealant: Color-coordinated, primerless silicone or high grade, non-drying butyl as recommended by panel manufacturer. Do not use sealant containing asphalt.

F. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: Stable after testing at 240 deg F per ASTM D 1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F per ASTM D 1970.
   3. Available Products: Subject to compliance with requirements and approval of roofing panel Manufacturer, provide one of the following, or other approved equal:
      a. Carlisle WIP Products, a division of Carlisle Construction Materials; 40 mil, WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; 40 mil Grace Ice and Water Shield HT, or 30 mil Grace Ultra.
      c. Henry Company; 40 mil Blueskin PE200 HT.

PART 3 - EXECUTION

3.01 COORDINATION AND INSPECTION

A. Coordinate with other trades, prior to rough-in and penetrations, exact locations for roughing-in of components and systems penetrating metal panels to verify actual locations of

penetrations relative to seam locations of metal panels. Pipe and other small penetrations shall not be located in roof panel seams. Large equipment shall be located to avoid valleys and damming conditions to the maximum extent possible. Examine and confirm these locations again before installation to avoid conflicts.

1. Contractor is responsible to relocate pipe and similar penetrations as required to avoid seams, and to relocate curbs and larger equipment as required to avoid dams or other ponding conditions. Contractor shall not be due additional compensation to relocate items and make other corrections as required due to failure of Contractor to coordinate between trades.

B. Fabricator and erector are responsible for inspecting existing conditions to verify general conditions, panel profiles and panel attachments and examine all parts of existing building affecting the installation of his work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SELF-ADHERING UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply underlayment, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches and staggered 24 inches between courses. Overlap side edges not less than 4 inches. Roll laps with roller. Extend underlayment into gutter troughs. Cover underlayment within 14 days or Manufacturer's maximum exposure time, whichever is less.

1. Apply over the entire roof surface

3.03 PANEL INSTALLATION

A. Panels indicated on drawings as damaged and therefore to be replaced shall be field cut in workmanlike manner to appropriate lengths for installation.

B. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weathertight installation.

C. Remove all strippable coatings and provide a dry wipe-down cleaning of the panels as they are erected.

1. Comply with Manufacturer's installation instructions for cleaning. Do not use cleaners or methods that will affect the weathering of panels intended to weather or patina, unless otherwise indicated for pre-patina treatment.

D. Install panels to interlock with adjoining panels in order to prevent water penetration and air leakage per industry standards.

E. Fasten panels to substrate with concealed fasteners per manufacturer's recommendations.

F. Panels shall be installed plumb and true in proper alignment with existing lines of panels.

3.04 ACCESSORY INSTALLATION

A. Dissimilar Materials: Isolate aluminum surfaces from contrasting steel or other ferrous metals using EC-1202 tape or zinc chromate paint.

B. Closures: Furnish and install closures where missing at all ends of existing horizontal siding abutting window framing, door frames, storefront, adjoining walls, etc. where panel profile is exposed to view. Closure shall be installed using proper adhesive and fit flush with edge

of panel. Caulk perimeter of closure. Coordinate installation with paint preparation and painting.

C. Trim: Install aluminum trim using specified fasteners at location shown on drawings.

3.05 PROTECTION AND REPAIR

A. If applicable, remove factory protective plastic coatings at time as recommended by roofing Manufacturer. Do not allow protective coatings to melt onto roof panel surfaces.
   1. For metal surfaces intended to weather or patina, wear gloves and take precautions to avoid spills, oil from hands and skin, etc. that can leave marks or cause uneven weathering of panel surfaces. Require the same of other trades working on or near panel surfaces after installation.

B. Protect panels from damage during remainder of construction period. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and / or Owner.

END OF SECTION 07 40 00

SECTION 07 46 46 - MINERAL-FIBER CEMENT SIDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes Pre-Stained for the following:
   1. Fiber-cement soffit panels and accessories.
   2. Fiber-cement trim.

B. Related Sections include the following:
   1. Division 06 Section - Rough Carpentry.
   2. Division 06 Section - Sheathing.
   3. Division 07 Section - Sheet Metal Flashing and Trim for flashing, gutters, and other sheet metal work.
   4. Division 07 Section - Joint Sealers.
   5. Division 07 Section - Weather Resistant Barrier for building wrap application.
   6. Division 09 Section - Painting.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated, including material descriptions, available colors, dimensions and available finishes & patterns

B. Samples for Verification: For each type, color, texture, and pattern required.
   1. 12-inch- long-by-actual-width Sample of siding.

C. Maintenance Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit**,** including related accessories, through one source from a single manufacturer.

B. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects.
   1. Build mockup of typical soffit area as shown on Drawings.
   2. Mockup may become part of the completed work if approved by Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.07 SEQUENCING

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified Warranty period. Failures include, but are not limited to, cracking, deforming, fading or otherwise deteriorating beyond normal weathering.
   1. Warranty Period: 25 years, from date of Substantial Completion.

1.09 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. Furnish full lengths of soffit and trim in a quantity equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Allura USA, www.allurausa.com
   2. James Hardie Building Products, www.jameshardie.com
   3. Woodtone Industries, www.woodtone.com

B. Basis-of-Design Product: The design for each siding, accessories and soffit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified:

2.02 SOFFIT

A. Fiber-Cement Soffit: Panels made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
   1. Product Options:
      a. Allura USA soffit panel with factory-applied stained finish.
      b. Allura USA soffit panel with stained finish by Woodtone Industries
      c. James Hardie soffit panel with stained finish by Woodtone Industries
   2. Finish: "Smokey Alder" by Woodtone Industries or equal by Allura USA
   3. Pattern: 12-inch- wide sheets with cedar texture typical.
   4. Provide solid non-ventilated soffit panels.

2.03 ACCESSORIES

A. Fiber-Cement Accessories: Provide trim and other items as recommended by manufacturer for building configuration. Sizes as required, or as indicated on the drawings.
   1. Texture: Wood grain.
   2. Finish: Manufacturer's standard primer.

B. Soffit Vent: "Aluminum Ezvent Continuous Soffit Vent" by Tamlyn, 2" wide, mill finish, net free area of 9 square inches per linear foot.

C. Elastomeric Joint Sealant: Single-component urethane joint sealant complying with requirements in Division 07 Section - Joint Sealants for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

D. Fasteners:
   1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.

2. For fastening aluminum, use aluminum fasteners. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.03 INSTALLATION

A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

3.04 FINISHING

A. Pre-stained Finish as shown on the documents.

3.05 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 46

SECTION 07 54 00 - THERMOPLASTIC MEMBRANE ROOFING (PVC)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
   1. Fully adhered, PVC membrane roofing system.
   2. Roof Insulation.
   3. Prefabricated flashings, corners, parapets, stacks, vents, and related details.
   4. Fasteners, adhesives, and other accessories required for complete roof installation.
   5. Traffic protection.

B. Related Sections:
   1. Division 06 Section - Rough Carpentry for blocking, nailers, etc.
   2. Division 07 Section - Roof Specialties.
   3. Division 07 Section - Roof Accessories.

1.03 REFERENCES

A. UL: Underwriters Laboratories.
   1. Roofing Materials and System Directory: TGFU.R10128.

B. FMG: Factory Mutual Global.
   1. Factory Mutual Standard 4470 - Approved Standard for Class 1 Roof Covers.

C. ASTM: American Society of Testing and Materials.
   1. ASTM C 578-04a, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation, © 2004, ASTM International.
   2. ASTM C 1177/C1177M-04e1, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing, © 2004, ASTM International.
   3. ASTM C 1289-04, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, © 2004, ASTM International.
   4. ASTM C 1396/C1396M-04, Standard Specification for Gypsum Board, © 2004, ASTM International.
   5. ASTM D 146-04, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing, © 2004, ASTM International.
   6. ASTM D 570-98, Standard Test Method for Water Absorption of Plastics, © 1998, ASTM International.
   7. ASTM D 751-00e1, Standard Test Methods for Coated Fabrics, © 2000, ASTM International.
   8. ASTM D 828-97(2002), Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus, © 2002, ASTM International.
   9. ASTM D1079-05, Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials, © 2005, ASTM International.
   10. ASTM D 1204-02, Standard Test Method for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting or Film at Elevated Temperature, © 2002, ASTM International.
   11. ASTM D 2136-02, Standard Test Method for Coated Fabrics-Low-Temperature Bend Test, © 2002, ASTM International.
   12. ASTM D3045-03, Standard Practice for Heat Aging of Plastics Without Load, © 2003, ASTM International.

13. ASTM D 4434-96, Standard Specification for Poly(Vinyl Chloride) Sheet Roofing, © 1996, ASTM International.
14. ASTM D 5602-98, Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens, © 1998, ASTM International.
15. ASTM D 5635-04, Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens, © 2004, ASTM International.
16. ASTM E 108-04, Standard Test Methods for Fire Tests of Roof Coverings, © 2004, ASTM International.
17. ASTM E 119-00a, Standard Test Methods for Fire Tests of Building Construction and Materials, © 2000, ASTM International.
18. ASTM G 154-00, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials, © 2000, ASTM International.

1.04 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and glossary of NRCA's The NRCA Roofing and Waterproofing Manual for definition of terms related to roofing work in this Section.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Physical Properties: Roof product must meet the requirements of type III PVC sheet roofing as defined by ASTM D4434-96 and must meet or exceed the following physical properties.
   1. Thickness: 60 mil, nominal per ASTM D751.
   2. Breaking Strengths: >240 lbf. per ASTM D751, Grab Method.
   3. Elongation at Break: >30% per ASTM D751, Grab Method.
   4. Heat Aging per ASTM D3045: 176°F for 56 days. No sign of cracking, chipping or crazing. (per ASTM D4434).
   5. Factory Seam Strength: 75% of breaking strength per ASTM D751, Grab Method.
   6. Tearing Strength: >55 lbf. per ASTM D751, Procedure B.
   7. Low Temperature Bend (Flexibility): Pass -40°F per ASTM D2136.
   8. Accelerated Weathering: No cracking, checking, crazing, erosion or chalking after 20,000 hours per ASTM G154.
   9. Linear Dimensional Change: <0.5% per ASTM D1204 @176 ± 2°F for 6 hours.
   10. Water Absorption: < 3% per ASTM D570.
   11. Static Puncture Resistance: > 33 lbs. per ASTM D5602.
   12. Dynamic Puncture Resistance: > 20 ft-lbf per ASTM D5635.

D. Minimum UL Class A fire rating.

E. Testing Requirements: The roof system shall be tested in compliance with local code requirements and as follows:
   1. Wind Resistance: The roof system shall be tested in compliance with FM4474, and with UL 580 or UL 1897.
   2. Physical Weathering Properties: The system shall be tested to demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G154, or ASTM G155.

3. Impact Resistance: The system shall be tested to resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M, or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470.
4. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.

F. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
1. Fire/Windstorm Classification: Class 1A-W120.
2. Hail Resistance: MH.

G. Current International Code Council Evaluation Services Report or Legacy Report showing compliance with the International Building Code.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastener spacing and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for verification: For the following products:
1. 4-inch x 6-inch sample of roofing membrane, of color specified.
2. Sample of roofing membrane with factory weld.
3. 4-inch x 6-inch sample of walkway pad.
4. Termination bar, fascia bar with cover, drip edge and gravel stop if to be used.
5. A Sample of each fastener type to be used for installing membrane, insulation/recover board, termination bar and edge details.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in Performance Requirements Article.

F. ASTM D4434-96 Certification: Supply test results from qualified testing agency that states that the roofing product meets the requirements for type III PVC sheet roofing as defined in ASTM D4434-96.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

H. Field quality-control reports.

I. Maintenance Data: Outlining leak reporting procedure, maintenance requirements, and emergency repair procedures.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by FM Global and membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system as approved by membrane roofing manufacturer.

D. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.09 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Contractor Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the date of favorable inspection by the roof membrane manufacturer. Should any leaks covered under the warranty occur

during this period, corrective action will be taken by the contractor to repair the roof to the satisfaction of the owner and the roof membrane manufacturer. All corrective work will be done at no cost to the owner or the roof membrane manufacturer.

B. Manufacturer Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition the warranty must meet the following criteria:
   1. Warranty Period: 20 years from date of Substantial Completion.
   2. No exclusions for damage caused by water ponding or biological growth, or for incidental or consequential damages.
   3. Issued direct from and serviced by the roof membrane manufacturer.
   4. Transferable for the full term of the warranty.
   5. No additional charge for the warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Johns Manville.
   2. Duro-Last.
   3. Sarnafil Inc.
   4. GAF Materials Corporation.
   5. Carlisle Roofing.

2.02 PVC ROOFING MEMBRANE

A. PVC Sheet: ASTM D4434, Type III, fabric reinforced, as follows:
   1. Product: Subject to compliance with requirements, provide PVC roofing membrane that meets or exceeds the requirements stated under the section titled Performance Requirements.
   2. Thickness: 60 mils, +/- 2 mils.
   3. UL Class: A
   4. Exposed Face Color: White.
   5. Fully Adhered.

2.03 AUXILIARY MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

C. Prefabricated Flashing: Prefabricated flashings for pipes, curbs, inside and outside corners of same material, type, reinforcement, and color as PVC sheet membrane.

D. Sealants and Adhesives: Caulk, pourable sealant, mastic and adhesives must be supplied by the roof membrane manufacturer.

E. Slip Sheet and Cover Boards: Slip sheet or cover boards, of type required by the roof membrane manufacturer for the application.

F. Termination Bars: Standard rigid exterior vinyl bar, 1.5-inch wide with slotted holes 6-inch on center must be manufactured by the roof membrane manufacturer.

G. Edge Detail: Fascia bar and cover, prefabricated Drip Edge, prefabricated Gravel Stop and 2-Piece Compression Metal Edge must be manufactured by the roof membrane manufacturer in custom shapes and sizes as shown in drawings.

H. Vinyl Coated Metal: 24 gauge, hot-dipped galvanized, grade 90 metal with a minimum of 17 mil of manufacturers membrane laminated to one side.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and supplied by the roof membrane manufacturer.

J. Two-Way Vents: Provided by the roof membrane manufacturer. Must install a minimum of 1 vent per each 1000 square-feet.

2.04 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by PVC membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses and LTTR R-values indicated and that produce FM Approvals-approved roof insulation.
   1. Insulation Attachment: Adhered and/or Mechanically Fastened as required to achieve uplift resistance indicated.

B. Isocyanurate Rigid Foam Roof Insulation: ASTM C1289, Type II, Class 1, Grade 1. Panels shall have a nominal thickness of two staggered layers of 2" to achieve an Long Term aged Thermal Resistance R22.8 value per ASTM C1289-13e1.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.05 ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Roof Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.
   1. Product: Subject to compliance with requirements, provide Dens-Deck® Prime by Georgia-Pacific Corporation.

2.06 WALKWAYS

A. Flexible Walkways: Provide non-skid, maintenance-free walkway pads in areas of heavy foot traffic, around roof hatches, at top and bottom of roof access ladders, on all sides of mechanical equipment, under pipe pedestals and similar rooftop supports, and at other locations as indicated in the Drawings. Walkway pads must be manufactured by the roof membrane manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thickness of insulation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to the roof membrane manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.03 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to approved substrate as follows:
   1. Adhere insulation with product approved by the roof membrane manufacturer. Follow the roof membrane manufacturer's application guidelines.
   2. Set each layer of insulation in insulation adhesive. Follow adhesive manufacturer's application guidelines.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
   1. Fasten according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
   2. Fasteners and plates must be supplied by the roof membrane manufacturer.

3.04 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install prefabricated roofing sections over area to receive roofing according to the roof membrane manufacturer's written instructions.

1. Confirm that substrate is approved by the roof membrane manufacturer to receive adhered membrane.
2. If membrane is to be adhered to a substrate board or an insulation board, confirm that the board is attached per the roof membrane manufacturer's specification.
3. Apply adhesive within the temperature range and at application rates specified by the roof membrane manufacturer.

B. Accurately align each prefabricated roofing section in order to maintain overlaps of the minimum dimensions required by the roof membrane manufacturer.

C. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to the roof membrane manufacturer's written instructions to ensure a watertight seam installation.
1. Hot-air welded seams must be a minimum of 1-1/2 inch wide.
2. After seam has cooled make a hands and knees inspection with a probe. Repair any deficiencies found immediately.

D. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Penetrations: Utilize prefabricated flashings for penetrations such as pipes, equipment curbs, braces and pitch pockets. These flashings shall be made of the same membrane as the roof sections. Hot-air weld the flashing's skirt to the roofing section and properly terminate the flashing to the penetration per the roof membrane manufacturer's specification.

F. Drains and Scuppers: Follow the roof membrane manufacturer's specification to properly terminate the roofing sections at drains and scuppers. Clamping rings may be used to terminate the roof section at roof drains. If the drain does not have a clamping ring, or it cannot be used, a prefabricated drain boot must be used. Prefabricated flashings must be utilized for scuppers.

3.05 FLASHING INSTALLATION

A. General:
1. All penetrations must be at least 24" (61 cm) from curbs, walls, and edges to provide adequate space for proper flashing.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
4. Hot-air weld all flashing membranes, accessories, and coated metal. A minimum 2" wide (hand welder) weld is required.

B. Coated Metal Flashings:
1. Coated metal flashings shall be formed in accordance with current manufacturer construction details and SMACNA guidelines.
2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a ¼" gap to allow for expansion and contraction. Hot-air weld a 6" wide reinforced membrane flashing strip to both sides of the joint, with approximately 1" on either side of the joint left un-welded to allow for expansion and contraction. 2" wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.
3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Hot-air weld a 6" wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.

4. Provide a ½" hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
5. Provide a ½" hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. Reinforced Membrane Flashings:
1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with "Construction Detail Requirements".
3. Apply bonding adhesive at a rate resulting in 60 square feet/gallon of finished roofing material for solvent-based bonding adhesives, and at a rate of 125 square feet/gallon of finished roofing material for water-borne bonding adhesive. Apply bonding adhesive to both the underside of the membrane and the substrate surface at 120 square feet per gallon (Solvent Based) and 250 square feet per gallon (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition. The bonding adhesive must be allowed to dry until tacky to the touch before flashing membrane application.
4. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application.
5. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.

D. Un-reinforced Membrane Flashings:
1. Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.
3. The un-reinforced membrane flashing shall be adhered to the penetration surface. Apply bonding adhesive at a rate resulting in 60 square feet/gallon of finished roofing material for solvent-based bonding adhesives, and at a rate of 125 square feet/gallon of finished roofing material for water-borne bonding adhesive. Apply bonding adhesive to both the underside of the membrane and the substrate surface at 120 square feet per gallon (Solvent Based) and 250 square feet per gallon (Water Based).The bonding adhesive must be allowed to dry until tacky to the touch before flashing membrane application.

E. Roof Edges:
1. Roof edge flashings are applicable for gravel stop and drip edge conditions as well as for exterior edges of parapet walls.
2. Flash roof edges with coated metal flanges nailed 4" o.c. to pressure-treated wood nailers. Hot-air weld roof membrane to metal flanges.
3. When the fascia width exceeds 4", coated metal roof edging must be attached with a continuous cleat to secure the lower fascia edge. The cleat must be secured to the building no less than 12" o.c.
4. Alternatively, roof edges may be flashed with a 2-piece snap on fascia system, adhering the roof membrane to a metal cant with bonding adhesive and face nailing the membrane 8" on center prior to installing a snap-on fascia (MA-206, 207).

F. Parapet and Building Walls:

1. Flash walls with PVC membrane adhered to the substrate with bonding adhesive, loose applied (Less than 18" in height) or with coated metal flashing nailed 4" on center to pressure-treated wood nailers.
2. Secure membrane flashing at the top edge with a termination bar. Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 8" on center; termination bars that are counter flashed shall be fastened 12" on center.
3. Roof membrane must be mechanically attached along the base of walls with screws and plates (deck securement) or screws and inverted termination bar (wall securement) at the following rate:

Mechanically Attached Systems	Per in-lap on center spacing, with a 12" maximum
Fully Adhered Systems	12" on center

4. All coated metal wall flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.
5. Metal counterflashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with appropriate caulking.

G. Curbs and Ducts:
1. Flash curbs and ducts with PVC membrane adhered to the curb substrate with bonding adhesive, loose applied (Less than 18" in height) or with coated metal flashing nailed 4" on center to pressure-treated wood nailers.
2. Secure membrane flashing at the top edge with a termination bar. Water Block shall be applied between the curb/duct surface and membrane flashing underneath all termination bars. Exposed termination bars shall be mechanically fastened every 8"o.c.; termination bars that are counter flashed shall be fastened 12" on center.
3. Roof membrane must be mechanically attached along the base of walls with screws and plates (deck securement) or screws and inverted termination bar (wall securement) at the following rate:

Mechanically Attached Systems	Per in-lap on center spacing, with a 12" maximum
Fully Adhered Systems	12" on center

4. All coated metal curb flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.
5. Metal counterflashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with appropriate caulking.

3.06 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to roof membrane according to the roof membrane manufacturer's specification.

3.07 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Warranty: Upon receipt of the required materials, certifying inspection and acceptance of the installation by the roof membrane manufacturer, the warranty shall be duly executed and issued to the Owner.

3.08 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to the Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by the roof membrane manufacturer.

END OF SECTION 07 54 00

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide all metal flashing and sheet metal work, as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 06 Section - Rough Carpentry for blocking, nailers, etc.
   2. Division 07 Section - Shingles.
   3. Division 07 Section - Joint Sealers.
   4. Division 07 Section - Painting.
   5. Division 07 Section - Roofing.
   6. Division 07 Section - Metal Roof Panels for sheet metal flashing and trim integral with metal roof panels.
   7. Division 07 Section - Roof Specialties for manufactured roof specialties not part of sheet metal flashing and trim.
   8. Division 07 Section - Roof Accessories for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.03 PERFORMANCE REQUIREMENTS AND QUALITY ASSURANCE

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with the latest edition of NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Fabricated copings and roof edge flashings: Roof edge flashings shall be designed without exposed fasteners, including at the inside face of copings, and as follows:
   1. Wind-Uplift Resistance: Provide metal roof edge flashing assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
      a. Uplift Rating: UL 90.
   2. FM Approvals Listing: Design, fabricate and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90 or greater where required by local codes or authorities having jurisdiction, whichever requirement is most stringent. Identify materials with name of fabricator and design approved by FM Approvals.
   3. SPRI Wind Design Standard: Fabricated copings and roof edge flashings for low slope roofs shall be designed and installed for wind loads in accordance with IBC Chapter 16, including local code amendments as applicable, and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI/FM 4435/ES-1.

a. Roof edge products shall be UL Classified by Underwriters Laboratories, Inc. or other building code approved 3rd party verification of compliance with the ANSI/SPRI/FM 4435/ES-1 Wind Design Standard.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Account for temperature change of 120 deg F ambient, 180 deg F material surfaces.

E. Installer: Engage an experienced installer who has completed similar work of a comparable scale with a record of successful performance.

1.04 GUARANTEE

A. Sheet metal applicator and General Contractor shall personally guarantee sheet metal work for a period of Two-Years after acceptance of the building by the Owner against any defects or water leaks. Guarantee shall include all labor and materials necessary to correct any defects or water leaks upon notice from the Owner.

B. Furnish manufacturer's standard 20 year warranty stating architectural fluorocarbon finish will be:
   1. Free of fading of color change in excess of 6 NBS units as measured per ASTM D 2244-68;
   2. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;
   3. Will not peel, crack, chip, or de-laminate.

1.05 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Procedures for submittals.

B. Submit shop drawings for review and approval prior to ordering of materials and fabrication of the required shapes and metal flashings. Submittal for the coping system is required.

C. Failure by the contractor to submit shop drawings required above shall release the Architect from any liabilities due to the negligence on the part of the Contractor to comply with the construction documents.

D. Samples: Submit samples of sheet metal flashings, trim, copings, accessory items, and prefinished items of profiles, gauge and finish to be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet metal for receivers and counter-flashings: 24 gauge or as noted on drawings galvanized sheet steel bent to required shapes.

B. Lead: Weight 4 lbs. per square foot.

C. Solder: ASTM D32, Alloy gauge 58, 50% tin, 50% lead.

D. Gutter, Downspout and Fascia at Canopies and Metal Roofing: 24 Gauge galvanized steel with Kynar 500 coating. Provide 1" straps at 30" o.c. and bracket hangers at 30" o.c. Gutter to be color as selected by Architect from manufacturer’s full range.

E. Shop-Fabricated Scupper: Fabricate from 24 Gauge galvanized steel with Kynar 500 finish. Formed one-piece through wall scupper flashing with flange extending at least 4" in all directions from scupper and at least 4" onto roof surface (4" beyond roof cants at overflow

scuppers). Basis of Design construction shall be patterned on a scupper as manufactured by OMG Roofing Products or approved equal. Provide with prefinished Kynar snap-on face trim in color as selected by the Architect.

F. Finish for Galvanized Steel: Kynar coating in colors as selected by Architect.

G. Nails for Sheet Metal Work: 10 Gauge galvanized ring type steel of sufficient length to adequately secure sheet metal work.

H. Precast Concrete Splashblock: 12" x 24"; provide one per downspout.

I. Aluminum Trim Fasteners: Exposed fasteners shall be aluminum or stainless steel. Unexposed fasteners may be cadmium or zinc plated steel in accordance with ASTM A164-55 and 165-55. Steel anchors shall be properly insulated from aluminum.

J. Roof Penetration Flashing: Lead coated copper 16 oz./SF. Roof Penetration Flashing: Lead coated copper 16 oz. /SF.

K. Through-Wall, Door/Window Sill and Head Flashings:
   1. Where embedded in masonry (not exposed to view): 3 oz. copper composite Multi-Flash 500 by York or approved equal.
   2. Where exposed to view: Prefinished 24 gauge galvanized steel with PVDF coating in color(s) as selected by Architect. Provide with drip edges hemmed 1/2” on underside.

L. Reglets: Equal to Fry original metal reglet.

M. Counter Flashing. "Springlock Flashing" by Fry Reglet.

N. Sheet Metal Fasteners: Galvanized steel with washers where required.

2.02 FABRICATION

A. All exposed edges shall be hemmed 1/2" on underside.

2.03 METAL FINISHES

A. General: Comply with Aluminum Association’s (AA) "Designation System for Aluminum Finishes: for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating; as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s instructions.
   1. Fluoropolymer 2-Coat Coating system: Manufacturer’s standard 2-coat, thermo cured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
      a. Color and Gloss: As selected by Architect from manufacturer’s full range of choices for color and gloss.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES

A. Applicator responsible for inspecting substrates upon which sheet metal materials are to be placed for any defects or conditions that would impair finished installation. Application constitutes acceptance of the substrate.

3.02 APPLICATION

A. Details shown are design details, fabrication techniques, and methods as per SMACNA recommendations.

B. Proper and adequate provisions shall be made in fabrication, installing and fastening sheet metal work for expansion and contraction of metal and other materials entering into the work so that pulling, splitting, opening of joints, warpage or other failure of the work shall be prevented. Expansion joints in sheet metal placed not farther than 40 feet apart. Dissimilar metal surfaces contacting one another, protected by bituminous coating to prevent galvanic or corrosive action from occurring.

C. Counter flashing constructed in lengths not exceeding 10 feet and installed in receiver so that flashing lays tightly against base flashing and overlaps base flashings a minimum of 4 inches. Joints between sections shall be tight and lay flat. Metal at corners continuous. Bent, crimped or warped sections are not permitted.
   1. Coordinate counterflashings with roofing installation of termination bars at top edge of roofing base flashings.

3.03 INSTALLATION

A. General: unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by method indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
   1. All complete work shall be water and weathertight. Joints, cuts, miters, splices or other installation means made as neat as possible. Fastenings as inconspicuous as possible.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicate, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less that 1 inch deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.
   1. Do not solder the following metals:
      a. Aluminum.
   2. Pretinning is not required for the following metals:
      a. Lead-coated copper.
   3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

E. Sealed Joints: Form no expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
   1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
   1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
   2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H. Roof-drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA'S Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

I. Roof-Penetration Flashing; Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
   1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
   2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

J. Precast Concrete Splash Blocks: Install where downspouts discharge on grade unless otherwise shown.

3.04 FLASHING & COUNTERFLASHING REQUIREMENTS

A. Joints in thru-wall flashings and counterflashings shall be lapped 4" minimum with laps bedded in sealant.

B. Head and sill flashings shall not have joints and shall have sides turned up (edge dams) with all corners folded, not cut and shall extend 9" minimum beyond both sides of opening.

C. Head, sill and thru-wall flashings shall be set in a bead of sealant applied under the exterior edge of the flashing and on top of the masonry or lintel angle on which the flashing rests.

D. Penetrations in thru-wall flashing are not permitted. Vents in thru-wall flashing shall be completely flashed and water tight.

E. Metal reglets shall have a bead of sealant installed to complete system with counterflashing.

F. All thru-wall flashing shall extend through and up the interior face of exterior sheathing, as applicable.

G. Install metal jamb flashing, in material as noted, over adjacent air barrier system at jambs of curtainwall and other locations as shown on the drawings, as required to close openings to cavity wall. Mechanically attach with stainless steel fasteners and seal metal flashing to wall / air barrier with self adhering membrane flashing as specified in Division 07 Section - Modified Bituminous Sheet Air Barriers.

3.05 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

END OF SECTION 07 62 00

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Pre-Manufactured Coping Systems.
   2. Reglets and counterflashings.

B. Related Sections:
   1. Division 06 Section - Rough Carpentry for wood nailers, curbs, and blocking.
   2. Division 07 Section - Singly Ply Roofing Membrane (PVC).
   3. Division 07 Section - Flashing and Sheet Metal for custom and site-fabricated sheet metal copings, flashing and trim.
   4. Division 07 Section - Roof Accessories for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   5. Division 07 Section - Joint Sealants for field-applied sealants between roof specialties and adjacent materials.

1.03 PERFORMANCE REQUIREMENTS AND QUALITY ASSURANCE

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
   2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

C. Sheet Metal Standard for Flashing and Trim: Comply with the latest edition of NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
   1. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. Wind-Uplift Resistance: Provide metal roof edge flashing assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

E. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1A-120 , or greater where required by local codes or authorities having jurisdiction, whichever requirement is most stringent. Identify materials with name of fabricator and design approved by FM Approvals.

F. SPRI Wind Design Standard: Manufactured copings and roof edge flashings for low slope roofs shall be designed and installed for wind loads in accordance with IBC Chapter 16, including local code amendments as applicable, and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI/FM 4435/ES-1.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Account for temperature change of 120 deg F ambient, 180 deg F material surfaces.

H. Installer: Engage an experienced installer who has completed similar work of a comparable scale with a record of successful performance.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
   1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   3. Details of termination points and assemblies, including fixed points.
   4. Details of special conditions.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification: For copings, reglets and counterflashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.05 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.

B. Warranty: Sample of special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.07 WARRANTY

A. Coping System: Special Performance / 20-Year Warranty: Manufacturer shall guarantee that a coping system up to 32" wide, when installed per manufacturer’s instructions, will not blow off, leak, or cause membrane failure, even in wind conditions up to 130 mph, or the manufacturer shall at their option repair or replace their materials.

B. Furnish manufacturer's standard 20 year warranty stating architectural fluorocarbon finish will be:
   1. Free of fading of color change in excess of 6 NBS units as measured per ASTM D 2244-68;
   2. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;
   3. Will not peel, crack, chip, or de-laminate.

C. Furnish written warranty signed by applicator for two year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight conditions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

PART 2 - PRODUCTS

2.01 EXPOSED METALS

A. Galvanized steel G90 with factory applied Kynar 500/Hylar 500 finish.

2.02 CONCEALED METALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.05 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 10 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide OMG Roofing Products, "Permasnap-2 Plus" as recommended by manufacturer for specified performance criteria, or approved equal by another manufacturer.
3. Coping-Cap Material: Galvanized steel, minimum of 22 gauge or greater where required by coping size or performance criteria, G90 with factory applied Kynar 500/Hylar 500 finish.
   a. Color: As selected by Architect from manufacturer's full range.
4. Corners: Factory pre-formed, mitered and continuously welded.
5. Splice Plates: Concealed, of same material & finish as coping.
6. Special Fabrications: Two-way sloped coping cap.
7. Coping-Cap Attachment Method: Face leg hooked to continuous cleat with snap-on back leg fastener exposed, fabricated from coping-cap material.
8. Cleats are minimum of 16 ga. galvanized steel. Chairs are metal in the same color and finish as the coping cap. Fabricated to the wall width required between 6" and 32".
9. Provide thicker gauges of cap and cleats than the minimum gauges as required to meet referenced standards and performance criteria. Contractor is responsible to determine where thicker gauges are required and include in their bid.

2.06 REGLETS AND COUNTERFLASHINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Fry Reglet Corporation or comparable product by one of the following:
   1. OMG Roofing Products.
   2. MM Systems Corporation.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
   1. Galvanized steel (24 ga.) G90 with factory applied Kynar 500/Hylar 500 finish.
   2. Corners: Factory mitered and mechanically clinched and sealed watertight.
   3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 10 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
   1. Galvanized steel (24 ga.) G90 with factory applied Kynar 500/Hylar 500 finish.
      a. Color: As selected by Architect from manufacturer's full range.

D. Accessories:
   1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
   2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.07 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.03 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 10 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1 recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.04 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to meet performance requirements.

1. The first cleat/chair set should be installed with the center line of the cleat set to the miter leg length (see chart on front page) and 24" (300mm) from the end of a wall. Install cleats/chairs sets at all corners and ends first, then work along the wall to the center locating sets every 60" on center for walls less than 17" and 40" on center for walls 17" - 32". Adjust the cleat location in the middle of a run to fit a short coping length. This procedure will provide a symmetrical appearance of the installed coping. Install metal gutter chair/concealed joint covers at joint locations. Hook coping face leg over the cleat face (front) leg and swing over the top. Snap the roof side (back) leg by pressing firmly down on the back edge directly over the cleat chair sets. Leave a 1/4" gap at each joint for thermal movement. Anchor shall be placed per manufacturer's required spacing that meets performance requirements.

3.05 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Division 04 Section - Unit Masonry Assemblies for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.06 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide roof accessories including pre-fabricated roof curbs, pipe pedestals, pipe portals and other items as indicated on the drawings.

B. Related Sections include the following:
   1. Division 06 Section - Rough Carpentry, for wood blocking.
   2. Division 06 Section - Sheathing
   3. Division 07 Section - Roofing Section(s).
   4. Division 07 Section - Sheet Metal Flashing and Trim.
   5. Division 07 Section - Roof Specialties.
   6. Division 07 Section - Sealants.
   7. Division 22 Sections for Plumbing.
   8. Division 23 Sections for Mechanical.
   9. Division 26 Sections Electrical.

1.03 QUALITY ASSURANCE

A. Comply with "NRCA Roofing and Waterproofing Manual" for installation of units.

1.04 SUBMITTAL

A. Submit manufacturer technical product data and rough-in diagrams, details.

1.05 PRODUCT DELIVERY

A. Deliver products in manufacturers original unopened packages, clearly marked with brand name and model number.

B. Store materials on clean, raised platforms with weather protective covering when stored outdoors.

1.06 WARRANTY

A. Manufacturer shall guarantee against defects in material and workmanship for a period of five years.

B. Metal roof pipe boot warranty: Manufacturer's standard 20 year warranty.

1.07 PROJECT CONDITIONS

A. Any equipment curb heights indicated in Drawings are minimum curb heights required in general. Taller curbs may be required for minimum height above adjacent roofing for roof warranty, including tapered insulation and crickets. All curbs shall be tall enough to accommodate minimum curb height, or minimum heights above roof as indicated in Drawings, or minimum 8" above highest adjacent roof surface, whichever is greatest. Coordinate with roofing installer to confirm total curb heights required.

B. Do not install materials during inclement weather or when air temperature may fall below 40 ° F, including wind chill.

C. Do not install materials over damp, frozen or otherwise unsuitable surface.

PART 2 - PRODUCT

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Custom Curb, Incorporated, Chattanooga, TN (800) 262-6669.
   2. Kentuckiana Curb Company, Louisville, KY (800) 382-2872.
   3. The Pate Company, Broadview, IL (800) 243-3018.
   4. Thybar Corporation, Addison, IL (708) 543-5300.
   5. Bilco

B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.02 MATERIALS

A. Prefabricated Roof Equipment Support: Welded 18 gauge welded galvanized steel and integral base plate with factory installed 2 x 4 pressure treated wood nailer, and heavy gauge galvanized steel counterflashing. Reinforcing on sides greater than 36". Supports to be provided at all HVAC roof top condensers and as shown on drawings. Unit shall be tapered to provide level rooftop equipment, as manufactured by the Pate Co., Model #ES-2, or approved equal.

B. Pipe Pedestals: Freestanding pipe stand made of UV stabilized polycarbonate with nylon roller for piping up to 4". Miro Industries "Miron TPC" or equal.

C. Pipe Seal Boots for Metal Roof: Gasketed pipe boot with flexible aluminum base plate and integral graduated silicone pipe seal. Silicone seals shall be UV and ozone resistant and rated for high temperature resistance (tested to minimum 225˚F continuous exposure). Subject to compliance with requirements, provide Aztek Washer Company "Master Flash", Marco Industries "Roof Boots", or approved equal.
   1. Type and configuration to suit roof pitch.
   2. Sizes: Sized to pipe penetrations.
   3. Color: Light Gray.
   4. Hardware: Provide with adjustable metal clamp for clamping top of graduated boot to pipe, and Manufacturer's recommended base fasteners for the conditions and substrates as indicated.

D. Accessories:
   1. Fasteners: Manufacturer's recommended gasketed fasteners for substrates and conditions indicated.
   2. Sealants: As recommended by Manufacturer for conditions and substrates indicated. Where sealants may be visible in completed work, sealant colors shall match roofing or adjacent materials as selected by Architect from available standard colors.

2.03 FABRICATION

A. Curb Cap Flashings: All curb cap flashings without exception shall be one piece galvanized steel construction with no rivets or sealant joints, and with pre-punched holes on vertical surface for mechanical fastener attachment to curbs. Except for equipment support curbs required to be a level mounting surface, top side of curb cap flashings shall have slight slope

to drain away from penetrations on all sides. Penetration openings shall be fabricated to dimensions of penetrating items and shall turn up integral with flashing cap at least one inch, with a turned out lip for applying sealant, unless otherwise approved by Architect.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate between trades as required to ensure waterproof installation acceptable to roofing installer and Manufacturer.
   1. Ensure roof curbs meet minimum height requirements above adjacent roofing, including insulation thickness, tapered insulation, and crickets.
   2. Verify and coordinate actual roof slopes as required for level top of curbs.
   3. Coordinate installation of roofing membrane pads under all support pedestals.

B. Coordinate between roofing, mechanical, plumbing and other trades as required to ensure that duct and pipe penetrations occur in the middle of roof panels and not at standing seams between panels. Locate ducts and offset pipes below roof deck penetrations as required to avoid roofing seams.

3.02 INSPECTION

A. Examine areas to receive roof accessories to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from grease, oil or other debris which would affect proper installation. Application constitutes acceptance of substrate conditions.

3.03 INSTALLATION

A. Accessories installed in accordance with current printed recommendations of Manufacturer and to roofing manufacturer's requirements.

B. Coordinate installation of accessories with roof and flashing installations. Provide weathertight installation.

C. Accessories secured in place to withstand wind loads in accordance with the local building codes.

D. Fasteners, General: All fasteners shall be installed straight and to make proper seal at gaskets. No fasteners of any sort are allowed through top side of curb cap flashings. All fasteners in flashing caps shall be through vertical sides only. No fasteners of any sort are allowed through roofing membranes or materials unless specifically approved in writing by roofing installer and manufacturer, and approved by Architect.

END OF SECTION 07 72 00

SECTION 07 72 50 - PASSIVE EXHAUST VENTILATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes: Roof mounted, passive exhaust ventilator with no moving parts including roof mounting flanges, extension collars, roof adapters as required.

B. Related Sections:
1. Division 07 Section “Metal Roof Panels”.

1.03 REFERENCES

A. Miami-Dade County, Florida, Hurricane Code:
1. Protocol PA 301 - Wind Driven Rain Test per PA 100 (A)-95.

1.04 PERFORMANCE REQUIREMENTS

A. Passive ventilators shall have been tested to:
1. Withstand 130 miles per hour wind without damage.

1.05 SUBMITTALS

A. Provide in accordance with Divison 01 Section Submittal Procedures:
1. Product data for ventilator roof mounting flanges, collar extensions, roof adapters as required. Include data showing compliance with Paragraph 1.2.
2. Shop drawings: Indicate dimensions, construction, and installation details.
3. Certificates documenting ventilators have been successfully tested in accordance with Paragraph 2.2.E.
4. Manufacturer's installation and maintenance instructions.
5. Copy of warranty required by Paragraph 1.4 for review by Architect.

1.06 WARRANTY

A. Lifetime warranty to initial owner to cover defects in ventilator materials and workmanship.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Active Ventilation Products, Inc.
   1. Address: P.O. Box 1521, Newburgh, New York 12551-1521,
      Telephone: 800-247-3463 or 845-565-7770, FAX: 800-766-3836
   2. Website: www.roofvents.com
   3. E-mail: sales@roofvents.com

B. Requests to use equivalent products of other manufacturers shall be submitted in accordance with Division 01 Section "Product Substitution Procedures".

2.02 PASSIVE EXHAUST VENTILATORS

A. Type: Roof mounted, low profile, circular, hurricane rated, passive exhaust ventilator with no moving parts; Aura Ventilator Model No. AV-08 as manufactured by Active Ventilation Products, Inc.

B. Material: Heavy gauge aluminum.

C. Finish of exposed to view surfaces: Electrostatically applied powder paint coating. Color selected from manufacturer's standard range.

D. Construction: Two concentric cylinders of slotted vertical vanes. Inside cylinder connects to ventilator collar and roof mounting flange. Top of ventilator is solid. Area between inside and outside cylinders is open on bottom. Ventilators with moving parts or electrical operation are not acceptable.

E. Operation: Ventilator is wind driven, noiseless, and maintenance free. Outside air moving against vanes of outer cylinder is directed to create circular air flow inside ventilator. Vanes of inner cylinder face in same direction as air movement created by outside cylinder. Air movement creates venturi effect which produces negative pressure and pulls air from within attic expelling heat and moisture.

F. Hurricane rated: Construct ventilator to comply with Miami-Dade County, Florida, Hurricane Code, Protocol PA 301.

G. Size:
   1. Inside diameter: 8 inches.
   2. Outside diameter: 11 inches.
   3. Height: 10 inches.

H. Net free vent area: 50 square inches.

I. Roof mounting flange: 12 inches square flange fabricated from 0.025 inch aluminum and designed to accommodate metal roofing.

J. Collar extensions: Equip ventilator with extension collars to provide 4 inches high stack.

K. Sealants: Type as recommended by manufacturer for application and type of roof substrate.

L. Fasteners: Corrosion resistant screws, nails, staples or other fasteners of type, size, and spacing as recommended by manufacturer for application and type of roof substrate.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate provision of passive ventilator with roof system specified in Division 7 Section "Metal Roof Panels" to ensure compatibility of substrate to receive ventilator.

B. Examine site conditions and verify that structural supports and openings are properly sized, prepared, and ready to receive ventilator.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings. Coordinate with installation of roofing system, curbs, and flashings to ensure weathertightness.

B. Locate ventilators as indicated on Drawings. Ensure openings do not conflict with roof framing members. Accurately cut opening in roof substrate using template and pilot hole.

C. Install plywood roof sheathing as detailed on Drawings and approved shop drawings.

D. Apply bituminous paint on aluminum surfaces in contact with dissimilar metals.

E. Roof mounting flange installation on metal panel roof:
1. Ensure openings are centered between ribs of metal roof panel and there is sufficient flat surface to accommodate roof mounting flange.
2. Apply butyl tape sealant to bottom of roof mounting flange around complete perimeter. Use nylon spacers between roof panel and flange to eliminate sealant migration due to compression.
3. Fasten roof mounting flange with self-tapping hex head coated fasteners with metal washer and neoprene sealing washer of size and spacing as recommended by manufacturer.
4. If head is removed, provide temporary cap over roof mounting flange opening.

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Furnish all labor, materials, tools, equipment and related items required for the complete installation of firestopping at penetrations through rated partitions and floors.

B. Related Sections include the following:
   1. Division 03 Section - Concrete.
   2. Division 06 Section - Wood Framing
   3. Division 09 Section - Gypsum Board Assemblies.

1.03 STANDARDS

A. All work under this section shall conform to the requirements of the Underwriters' Laboratories, Inc., the National Board of Fire Underwriters and the local building code. Where requirements specified differ from the requirements of any authorities having jurisdiction, the more stringent requirements shall apply.

B. Firestopping system shall be a complete system of materials supplied by one manufacturer.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer:
   1. Five years experience in performing installation of materials with similar quantities of fireproofing materials.
   2. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

C. Requirements of regulatory agencies:
   1. Building code requirements of the municipality for fire resistance ratings of areas to receive fireproofing materials.
   2. Underwriters' Laboratories, Inc.: Classification marking.
   3. Acceptance by ICBO, BOCA and SBCCI as described by National Evaluation Service Report, NER-332.

D. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced.

E. Testing:
1. Fire resistant rating of assemblies - ASTM E-814.
2. Compound shall meet all requirements of UL 1479.

1.05 SUBMITTALS

A. Test Reports
1. Submit copies of fire test reports of fireproofing installation to substrate materials required.
2. Submit certified test reports of acceptable testing agencies which perform testing in accordance with ASTM E-119 and E-84.

B. Manufacturer's Instruction: Furnish manufacturer's printed material specifications and installation instruction for each type of fireproofing.

C. Certificates:
1. Furnish manufacturer's certification that materials meet or exceed specification requirements.
2. Furnish applicators certification that material has been completed as specified to meet fire resistance ratings and application requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened packages bearing name of manufacturer and product identification.

B. Reject damaged packages found unsuitable for use and remove from job site.

C. Store materials off ground, under cover, and away from damp surfaces.

D. Keep materials dry at all times.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include floors, floor/ceiling assemblies, & ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

B. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

C. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

2.02 MATERIALS

A. Safing Insulation: Forming material, minimum 3" unfaced safing insulation with a nominal density of 4 pcf, and bearing the UL Classification Marking shall be "Thermafiber" as manufactured by Owens Corning.

B. Compound: Pliable, non-toxic, non-combustible, non-asbestos, low density, lightweight compound shall be "Firecode" as manufactured by USG Corp., "Flame Stop V" as manufactured by Flame Stop Inc. or "Metacaulk" as manufactured by Rectorseal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that all substrates to receive firestopping system are constructed according to the Construction Documents and acceptable to receive fire stop materials.

3.02 APPLICATION

A. Safing Insulation: Cut safing insulation slightly wider than the opening. Compress and tightly fit min. 2 1/2" or 3" thickness of insulation with nominal density of 4 pcf completely around penetrant.

B. Firestopping Compound: Trowel apply the compound from its container and work into the penetration opening. Apply compound to minimum 1/2" to 1" thickness on top of safing insulation. Ensure that compound is in contact with all surfaces and that entire opening is filled with safing and compound. Utilize appropriately rated product for specific rated partition application.

END OF SECTION 07 84 13

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: Provide sealant required to close joints that would allow moisture or air to enter structure between fixed materials, as shown on the drawings and as herein specified, including but not limited to:
   1. Sealing of interior perimeter joints of window framing, door frames, and other openings in walls.
   2. Setting of thresholds in sealant.
   3. Sealing of joints between countertops and wall surfaces for a sanitary joint.
   4. Sealing of joints of every nature and description that would allow moisture or air penetration.
   5. Sealing of joints indicated to be caulked or sealed whether specifically mentioned herein or not.
   6. Sealing around all pipe, duct and vent penetrations.
   7. Sealing at paving joints.

B. Related Sections include the following:
   1. Division 04 Section - Manufactured Stone.
   2. Division 06 Section - Interior Architectural Woodworking.
   3. Division 07 Section - Sheet Metal Flashing and Trim.
   4. Division 07 Section - Metal Panels.
   5. Division 07 Section - Roofing.
   6. Division 08 Section - Aluminum Entrances and Storefront.
   7. Division 09 Section - Ceramic Tiling.
   8. Division 09 Section - Gypsum Board Assemblies.
   9. Division 09 Section - Painting.
   10. Division 21 Section - Fire Suppression.
   11. Division 22 Section - Plumbing.
   12. Division 23 Section - Mechanical.
   13. Division 26 Section - Electrical.
   14. Division 32 Section - Paving.

1.03 JOB CONDITIONS

A. Environmental Conditions: Sealant work not permitted when air temperature is below 40 degrees F.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, color range, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product or joint backing material.

B. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Submit samples of joint backing material.

1.05 WARRANTY

A. The Contractor shall submit, in writing, a warrant that all sealant work executed under this Section shall be free from defects in materials and workmanship for a period of two (2) years from date of acceptance of the Project, and he shall remedy any defects in the sealant work during the warranty period.

PART 2 - PRODUCTS

2.01 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.

2.02 MATERIALS

A. Chemical Compatibility, General: 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. Primers: Non-staining type as recommended by sealant manufacturer for each working surface. Material shall not leave residue or stain on adjacent surfaces. Each joint must be primed prior to sealing.

C. Sealant for Interior and Exterior Masonry Control Joints: 2 part urethane sealant equivalent to "MasterSeal NP-2" by Sonneborne / BASF Chemical Co., "Dymeric 240" by Tremco, or "Dyna Trol II" by Pecora. Color to match adjacent surfaces.

D. Sealant for Re-glazing: Medium modulus silicone sealant shall be Tremco's "Spectrem 2", or approved equal. Color as selected by Architect.

E. Sealant for Exterior Concrete Paving and Sidewalk Joints: Two part urethane (self leveling) sealant equal to "MasterSeal SL-2" by Sonneborne / BASF Chemical Co., "Urexpan NR-200" by Pecora, or "THC-900" Tremco. Provide non-sag product at joints in vertical curbs, equal to "MasterSeal NP-2" by Sonneborne / BASF.

F. Caulking for Interior Joints: One part acrylic latex sealant equivalent to "AC-20" by Pecora, "Tremflex 834" by Tremco, "Acrylic Latex" caulk by DAP, or "Sonolac" by Sonneborn.

G. Caulking for Countertop Joints: One-part clear silicone sealant, 860 by Pecora, or equal.

H. Precompressed Expanding Foam Sealant: Shall be Gray "Illmod 600" as manufactured by "Tremco", Beachwood, Ohio or approved equal.

I. Joint Backing: ASTM C1330, Non-staining closed cell polyethylene foam rod oversized 30% to 50%, equal to "MasterSeal 920" by BASF.

J. Solvents and Cleaning Agents: Of a type specifically recommended by sealant manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Applicator shall examine surfaces receiving sealant or caulking for any defects or joint sizes which would not structurally perform or for any unusual conditions which would interfere with proper installation of sealant or caulking.

3.02 PREPARATION

A. Thoroughly clean all joints removing all foreign matter such as dust, oil, grease, dirt or other loose particles. Provide and apply non-staining primer as required by conditions and sealant manufacturer.

B. When primer is dry, compress backup and insert into joint leaving 1/4" to surface open for joint sealing or leave open 1/2 of joint width, but not less that 1/4".

C. Completely cut smooth and remove projection of existing gasket and/or sealant material at door and window framing to remain to achieve sound substrate for application.

3.03 APPLICATION

A. It is the intent and purpose and interpretation of this specification that in all areas, joints sealed shall be rendered structurally sound and impervious to the passage of water, moisture and dust.

B. Follow sealant manufacturer's instructions regarding mixing, surface application, priming and application procedure.

C. Sealant shall be applied under pressure with a hand or power activated gun having a nozzle of proper size to entirely fill joint void and shall be forced into joints with sufficient pressure to expel air and fill the joints solidly. All joint surfaces shall be neatly tooled to a smooth surface, free of wrinkles and result in a flush joint when dry.

D. Apply sealants when the ambient temperature is between 40° and 100° F.

E. All junctures between countertops, back splashes and walls shall be caulked with silicone sealant providing a sanitary tight joint.

F. All junctures between piping and substrate of partitions, floors and ceiling shall be caulked.

G. Precompressed expanding foam sealant shall be installed per manufacturer's requirements at all vertical expansion joints as noted on Drawings.

H. Apply sealant bead at least 1/2 inch thick under each edge of threshold. Remove excess and neatly point.

I. Apply sealant between brick veneer and coping on outside face of exterior wall.

J. Caulk perimeter of window frame, door frame or other items penetrating, intersecting or abutting walls, ceilings, floors, etc.

K. Prime surface as required and apply sealant at all glazing, at metal to metal and glass to metal joints within the system.

L. Apply bead of sealant at base of wall board.

M. Furnish and install acoustical sealant at the following locations:
   1. All penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
   2. All termination of partitions enclosing Noise Critical Spaces to abutting construction (e.g. partitions, structure, etc.)
   3. Both sides of door frames to abutting construction where doors are scheduled to have acoustical seals.
   4. Both sides of window frames to adjacent construction

5. Perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.

N. Backer Rod shall be used in all joints, product to be constructed of closed cell foam, or appropriate resilient material for sealant. Dimension shall be minimum 30% greater than joint width, unless otherwise indicated on details.

O. Fill paving sealant full width of joint, and to within 1/8" of paving surface.

3.04 CLEANING

A. Clean adjacent surfaces free of sealant or soiling resulting from this work as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition.

END OF SECTION 07 92 00

SECTION 08 11 00 - METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide metal doors, frames and storefronts as shown on the Drawings and as herein specified.

B. Related Sections include the following:
   1. Division 04 Section - Manufactured Stone.
   2. Division 06 Section - Rough Carpentry.
   3. Division 07 Section - Flashing, Sheet Metal.
   4. Division 08 Section - Hardware.
   5. Division 08 Section - Glazing.
   6. Division 09 Section - Gypsum Board.
   7. Division 09 Section - Stucco.
   8. Division 09 Section - Painting.

1.03 QUALITY ASSURANCE

A. Design Criteria: Doors and frames noted to have a specific hourly label, shall be Underwriter's Laboratories, Inc. labeled construction shall bear the required UL label.

1.04 SUBMITTALS

A. Manufacturer shall furnish a certificate to the Owner evidencing that materials delivered meet the labeled and/or fire resistive construction requirements.

B. Shop drawings and details based on the Contract Documents shall be submitted to the Architect for review prior to fabrication of materials. Shop drawings shall indicate all hardware mounting heights, reinforcement, opening sizes, etc..

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Material: Individually packaged in cartons, completely protecting frames.

B. Frames shall be stored under cover on wood sills that will prevent rust and damage.

1.06 JOB CONDITIONS

A. Coordination
   1. The Contractor shall provide door and frame manufacturer with an approved hardware schedule, templates and hand for all doors. Contractor shall advise door and frame manufacturer of any changes after information has been forwarded.
   2. Contractor will be completely responsible for coordination of information between hardware, door and frame manufacturers. Any materials not properly coordinated shall be replaced by the Contractor at his own expense.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Prefinished Aluminum Knock-Down Interior Door Frames: Frames shall be Raco Interior Products, Inc. "Solutions II", or approved equal. Framing throats to match dimensions of walls, with snap-on prefinished covers. Provide 1-1/2" face profile, unless otherwise indicated.
   1. Provide fire rated frames where indicated up to 45 minute rating complying with UL 10B, ASTM E152, and NFPA 252.

2.02 FABRICATION

A. Frames shall have all joints mitered and tightly fit. No putty or filler permitted at joints.

B. All door frames mortised for hinges as indicated in hardware specification. (Re: Door Schedule and Hardware Schedule for Number and Location.) Frames mortised and reinforced for hinges, (7 ga. 1-1/4" x 10" min.), strikes, (12 gauge steel), and surface applied hardware, (12 ga. steel), as required.

C. Throat Dimensions: Contractor shall coordinate throat dimensions with construction indicated, and indicate dimension in submittals:
   1. Exterior door frames: Provide standard throat dimensions, unless otherwise indicated. Throat depth shall be capable of meeting offsets from faces of wall as indicated, and to provide required anchorage.
   2. Interior door frames in stud and wall board construction: Unless otherwise indicated, size throats to wrap over wall sheathing on each side of partition walls.
   3. Other conditions: As indicated, and as required to suit conditions and adjacent construction.

D. All door frames shall be prepared for installation of silencers.

2.03 FINISH

A. Aluminum Knock-Down Frames: AA-M12C22A21 Clear Anodized.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Anchor ceiling struts to construction above with fasteners to suit conditions. Brace frames as necessary until built into permanent construction.

B. Exercise extreme care when installing door frames. All door frames which are installed out of plumb, distorted and not level or in a manner which does not permit proper installation of doors, must be removed and replaced with new frames in a manner satisfactory to the Architect.
   1. Knock-down frames installed with tight miter joints at corners and meeting at corners without any noticeable lip between head and jamb pieces.

C. Clearances:
   1. Allow maximum of 1/16" clearance at head and jamb.
   2. Allow maximum of 1/2" clearance at floors.
   3. Allow maximum of 1/4" clearance at thresholds.

3.02 PROTECTION AND CLEANING

A. Protect metal doors and frames and their finishes from damage and detrimental soiling during the remainder of construction.

1. Repair and repaint hollow metal damaged or soiled to eliminate evidence of damage, in manner acceptable to Architect. Replace components that cannot be repaired.
2. Replace knock-down frame components with damaged finish.

B. Clean doors and frames prior to inspection for substantial completion. Touch up paint finish as required. Clean with products that will not damage finishes. Clean in accordance with A.A.M.A. specifications 609.1 for anodized finishes.

END OF SECTION 08 11 00

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Solid-core doors with plastic laminate faces.
   2. Factory finishing of flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:
   1. Division 06 Section "Wood Framing".
   2. Division 08 Section "Metal Doors and Frames".
   3. Division 08 Section "Door Hardware".
   4. Division 08 Section "Glazing" for glass view panels in flush wood doors.
   5. Division 09 Section "Gypsum Board Assemblies".
   6. Division 09 Sections "Painting" for field finishing and touch-up of wood doors.

1.03 ACTION SUBMITTALS

A. Concurrent Review: Submit all door-related submittals together for concurrent review.

B. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.
   4. Indicate doors to be factory finished and finish requirements.
   5. Indicate fire-protection ratings for fire-rated doors.

D. Samples for Initial Selection:
   1. For factory-finished doors.
   2. Manufacturer's samples or selectors for louvers, frames, and other prefinished materials as applicable.

E. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 6 by 8 inches, for each material and finish.
   2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
   3. Samples for frames for louvers and light openings, 6 inches long, for each material, type, and finish required.

1.04 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors 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.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Deliver doors to building after wet trades have been completed and building is within normal occupancy humidity conditions. Doors shall be delivered in manufacturer's name and identifying symbol on covering. Doors shall be stored flat with protective coverings provided to protect surfaces. Doors shall not be dragged over one another.

C. Mark each door on top or bottom rail with opening number used on Shop Drawings.

1.07 PROJECT CONDITIONS

A. Comply with Manufacturer's environmental limitations.

B. Coordination:
   1. The Contractor shall provide door manufacturer with approved hardware schedules, templates and hand for all doors. Contractor shall advise door manufacturer of any changes after information has been forwarded. Contractor will be completely responsible for coordination between hardware, door and frame manufacturers. Any materials not properly coordinated shall be replaced by the Contractor at his own expense.
   2. Door manufacturer shall be responsible for properly coordinating information received by him so that doors are properly finished, machined and ready to hang.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Algoma Hardwoods, Inc.
   2. Curtis Corp.
   3. Eggers Industries.
   4. Graham; an Assa Abloy Group company.

5. Haley Brothers, Inc.
6. Mohawk Flush Doors, Inc.; a Masonite company.
7. Weyerhaeuser.
8. VT Industries Inc.

2.02 DOOR CONSTRUCTION, GENERAL

A. WDMA I.S.1-A Performance Grade: Heavy Duty.

B. Solid Wood Block Core Doors: 1-3/4" thick solid core wood doors with hardwood edges conforming to AWI Section 1300-G-3 for Type SLC-5 standards, bonded with exterior water-resistant, Type II resin glue.

C. Structural-Composite-Lumber-Core Doors:
   1. Structural Composite Lumber: WDMA I.S.10.
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.

D. Fire-Protection-Rated Doors: Doors noted to have a specific hourly label, fabricated in accordance with Underwriters' Laboratories requirements for label indicated. Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals as required. Comply with specified requirements for exposed edges.

E. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.03 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors :
   1. Grade: Custom.
   2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS or Grade HSH.
   3. Colors, Patterns, and Finishes: As indicated.
   4. Exposed Vertical and Top Edges: Plastic laminate that matches faces, applied before faces.
   5. Core: Either glued wood stave or structural composite lumber.

2.04 FABRICATION

A. Prefit and pre-machine wood doors at the factory.

B. Comply with the tolerance requirements of NWMA for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Provide flush edgings for wood doors receiving panic devices or other hardware where typical molding would conflict with hardware. Coordinate with door hardware.
   3. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Clearance Tolerances for Factory Fitted Doors: Align in frames for uniform clearance at each edge.
   1. Provide 1/8 inch at heads, jambs, and between pairs of doors.
   2. Allow maximum of 3/16" over threshold or saddle.
   3. Allow maximum of 1/2" over decorative floor coverings.
   4. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

D. Clearance Tolerances for Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Allow maximum of 3/16" at jamb and head.
   2. Allow maximum of 1/4" over threshold or saddle.
   3. Allow maximum of 1/2" over decorative floor coverings.
   4. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

E. Clearance Tolerances for Fire-Rated Doors: Install in accordance with NFPA 80 for fire rated doors, and the following maximum clearances, whichever is more stringent:
   1. 1/8" between door and frame.
   2. 3/8" between door bottoms and decorative floor finish.
   3. 1/8" between doors for pairs of doors.
   4. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

3.03 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely. Replace damaged material.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

C. Protect doors as recommended by door manufacturer to ensure that doors will not be damaged at time of Substantial Completion.

END OF SECTION 08 14 16

SECTION 08 17 43 - FRP ALUMINUM HYBRID DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.

B. Related Sections:
   1. Division 06 Section "Wood Framing".
   2. Division 08 Section "Metal Doors and Frames".
   3. Division 08 Section “Aluminum Entrances & Storefronts”.
   4. Division 08 Section "Door Hardware".
   5. Division 08 Section "Glazing".
   6. Division 09 Section "Gypsum Board Assemblies".

1.03 SUBMITTALS

A. 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.

B. 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.

1.04 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.

1.05 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.

1.06 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.
   1. Standard Period.
      a. Ten years starting on date of shipment.
   2. Limited lifetime
      a. 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.
   3. Finish
      a. Kynar painted aluminum: 10 years.
      b. Painted SL-17, SL-18, SL-19, SL-20 face sheets: 5 years.
      c. Painted AF-100, AF-200, AF-150 frames, AF-250 frames: 3 years.
      d. Anodized, aluminum:10 years.
      e. 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. Construction.
   1. Door Thickness.: 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.
   d. 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.
5. 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.
6. 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.
7. Cutouts.
   a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
8. 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.
9. 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. Thermally Broken Aluminum Framing.
1. Model.
a. SL-600TB.
2. Materials.
a. See 2.05.A.
3. Perimeter Frame Members.
a. Storefront frame with thermally broken pocket filler.
b. Factory fabricated.
c. Open-back framing is not acceptable.
4. Thermal Strut.
a. Pultruded fiberglass only, no other materials will be accepted.
5. Applied Door Stops.
a. 5/8" x 1-1/4" or 5/8" x 1-3/4", 0.125" wall thickness, with screws and weather-stripping.
b. Provide solid ½" aluminum bar behind door stop for closer shoe attachment.
c. Pressure gasketing for weathering seal.
d. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
e. Minimum ½" aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.
6. Caulking.
a. Caulk joints before assembling frame members.
7. Frame Member to Member Connections.
a. Secure joints with fasteners.
b. Provide hairline butt joint appearance.
c. Shear block construction only, no screw spline allowed.
8. Hardware
a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
c. Factory install door hardware.
9. Anchors:
a. Anchors appropriate for wall conditions to anchor framing to wall materials.
b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
c. Secure head and sill members of transom, side lites, and similar conditions.

2.04 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. 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.

2.05 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.

2.06 FINISHES

A. Door.
   1. Aluminum: Class 1 Anodizing, minimum 0.7 mils thick; Clear 215 R1, AA-M10C12C22A41.
   2. FRP Face Sheets: Through color. Color to be selected by Architect from Manufacturer's full range.

B. Frame
   1. Aluminum: Class 1 Anodizing, minimum 0.7 mils thick; Clear 215 R1, AA-M10C12C22A41.

2.07 ACCESSORIES

A. Vision Lite: Manufacturer's standard impact rated vision lites meeting TDI Windstorm requirements. Size as indicated on drawings

B. Hardware: Pre-machine doors and frames in accordance with templates from specified hardware in Division 08 Section "Hardware".

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 ADJUSTING & CLEANING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

B. Clean doors promptly after installation in accordance with manufacturer's instructions.

C. Do not use harsh cleaning materials or methods that would damage finish.

3.05 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 08 17 43

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Provide all access doors and frames for walls and ceilings as indicated in Drawings and as required for access to equipment and by authorities having jurisdiction, whether or not locations for access doors and frames are specifically indicated in Drawings.

B. Related Sections include the following:
   1. Division 06 "Rough Carpentry" for coordination of wood blocking.
   2. Division 09 Section "Gypsum Board" for gypsum board assemblies.
   3. Division 09 Section "Acoustical Ceilings" for suspended acoustical tile ceilings.
   4. Division 09 Section "Ceramic Tiling".
   5. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.03 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
   1. Method of attaching door frames to surrounding construction.
   2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain access doors and frames of each type through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 for vertical access doors and frames.
   2. ASTM E 119 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 COORDINATION

A. Verification: Coordinate with other trades to determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, electrical, or other concealed work.
   1. Size panels as required by controls to be accessed. Provide adequate sizes to service equipment accessed by doors and panels, and acceptable to authorities having jurisdiction.
   2. For replacement of access doors in existing construction, field measure to match existing opening sizes.

1.06 PRODUCT DELIVERY AND STORAGE

A. Deliver products in manufacturers original packages, clearly marked with brand name and model number.

1.07 WARRANTY

A. Manufacturer shall guarantee against defects in material and workmanship for a period of five years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Access Doors:
      a. Acoustical Products, Inc.
      b. Acudor Products, Inc.
      c. Bilco
      d. Babcock Davis
      e. J. L. Industries, Inc.
      f. Karp Associates, Inc.
      g. Larsen's Manufacturing Company.

2.02 WALL AND CEILING ACCESS DOORS AND PANELS

A. Ceiling Access Door (where passage is required for service access) at ceilings: Access panel with 5/8" gypsum board inlay, recessed aluminum extrusion frame, concealed non corroding two point pin hinge, and cylinder lock & key, equal to Acudor Products, Inc., DW5015
   1. Size: 30" x 30" where intended for passage, and sizes as required for intended service purpose in other locations.
   2. Fire rated model FWC-5015 to match adjacent construction when located in fire rated construction.

B. Attic Access Door (where passage is required for service access) at ceilings: Fire Rated Insulated Access Door equal to Acudor Products, Inc., FW-5050
   1. Sized to fit between wood trusses spaced 24" on center.

C. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Wall surfaces and gypsum board ceilings. Install at all location where valves or controls are concealed within walls, whether shown on the drawings or not.
   2. Door: Minimum 0.060-inch thick, 16 gauge sheet metal, set flush with exposed face flange of frame.
   3. Frame: Minimum 0.060-inch thick, 16 gauge sheet metal with nominal 1-inch-wide, surface-mounted trim.
   4. Fire rated to match adjacent construction when located in fire rated construction.
   5. Hinges: Continuous piano hinge.

6. Latch: Screwdriver-operated cam latch.
7. Finish:
    a. Satin stainless steel at tile, restrooms, and other wet locations.
    b. Shop primed steel for field applied painting in other painted wall and ceiling locations. Color to match adjacent finish.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas to receive door and frame to insure work of preceding trades is completed. Check surfaces to see that they are plumb in place, free from grease, oil or other debris which would affect proper installation. Application constitutes acceptance of substrate conditions.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

D. Installation: All access panel locations in Noise Critical Spaces shall be installed only where indicated on drawings. Location of additional proposed access panels shall be submitted by Contractor for approval.

3.03 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 33 26 - ROLLING COUNTER SHUTTERS

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. Section Includes:
   1. Provision and installation of manual rolling counter door assemblies including brackets, guides, tracks, hardware and installation accessories, where noted on drawings.

B. Related Sections include the following:
   1. Division 6 section - Wood Framing
   2. Division 6 section - Interior Architecutral Woodwork
   3. Division 8 section - Hardware

1.03 QUALITY ASSURANCE

A. Furnish all counter door units by one manufacturer for entire project.

B. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years experience in producing counter doors of the type specified

C. Installer Qualifications: Manufacturer's approval

1.04 SUBMITTALS

A. Shop drawings and details based on the Contract Documents shall be submitted to the Architect for review prior to ordering materials and shop fabrication. Also submit manufacturer's product data, roughing-in diagrams, and installation instructions for unit to be provided.

B. Closeout Submittals: Operation and Maintenance Manual

1.05 WARRANTY

A. Manufacturer's Standard Warranty: Two years from date of substantial completion against defects in material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: The Cookson Co., or approved equal.

2.02 PRODUCT INFORMATION

A. Model: ESC10

2.03 MATERIALS

A. Slat Configuration: Galvanized Steel with Finish as Described Below: No. 1F, interlocked flat-faced slats, 1-1/2 inches (38 mm) high by 1/2 inch (13 mm) deep, minimum 22 gauge ASTM A 653, Commercial Quality, galvanized steel with extruded tubular aluminum bottom bar with continuous lift handle and vinyl astragal

B. Finish: GalvaNex™ Coating System (Stock Colors):
   1. ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and tan baked-on polyester enamel finish coat.

C. Endlocks: Fabricate interlocking slat sections with high strength molded nylon endlocks riveted to ends of alternate slats.

D. Guides:
   1. Fabrication: Aluminum - Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners. Provide polypropylene pile runners on both sides of curtain to eliminate metal to metal contact between guides and curtain.
   2. Finish: Aluminum: Clear anodized.

E. Counterbalance Shaft Assembly: Barrel - Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.

F. Brackets: Fabricate from reinforced steel plate with bearings at rotating support points to support counterbalance shaft assembly and form end closures
   1. Finish: Standard (Stock Colors): Zirconium treatment followed by a tan baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

G. Hood: Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets.
   1. Finish: No hood provided when coil is above ceiling.

2.04 OPERATION

A. Manual Operation: Push-Up - Manual lift or pole with hook

2.05 ACCESSORIES

A. Locking: Padlockable slide bolt - on coil side of bottom bar at each jamb extending into slots in guides.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings

B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates

C. Commencement of work by installer is acceptance of substrate

3.02 INSTALLATION

A. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports

B. Follow manufacturer's installation instructions

3.03 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

3.04 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer

B. Remove surplus materials and debris from the site

3.05 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative

B. Instruct Owner's Representative in maintenance procedures

END OF SECTION 08 33 26

SECTION 08 41 13 - ALUMINUM ENTRANCES & STOREFRONT

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. Section Includes:
   1. Provide storefront (including aluminum doors and hardware), framing complete with glazing as shown on the drawings and as herein specified.

B. Related Sections:
   1. Division 05 Section - "Metal Fabrications".
   2. Division 06 Section - "Rough Carpentry".
   3. Division 07 Section - "Thermal Insulation".
   4. Division 07 Section - "Sheet Metal Flashing and Trim".
   5. Division 07 Section - "Joint Sealants".
   6. Division 07 Section - "Firestopping".
   7. Division 08 Section - "Door Hardware".
   8. Division 08 Section - "Glazing".
   9. Division 12 Section - "Window Treatments".

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glass breakage.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.

C. Structural Loads:
   1. Wind Loads: As indicated in structural drawings and as required by authorities having jurisdiction.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
    a. Operable Units: Provide a minimum 1/16 inch clearance between framing members and operable units.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration:
1. Fixed Framing: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 psf.
2. Entrance Doors: Maximum air leakage of 1.0 cfm/sq. ft. for pair of doors, and maximum of 0.5 cfm/sq. ft. for a single door, at a static air pressure differential of 6.24 psf.

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 8 psf.

H. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.25 as determined according to NFRC 200.

I. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996.
1. Large-Missile Test: For glazed openings located within 30 feet of grade.

J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Interior Ambient-Air Temperature: 75 deg F.

K. Brake Metal: Provide in thicknesses as required to prevent oil canning, including for exterior brake metal oil canning that may be caused by design wind loads. Additionally, thickness may be greater but shall not be less than minimum thicknesses as specified elsewhere in these specifications, or minimum thicknesses as indicated in Drawings. Contractor shall include necessary thicknesses in his bid.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Shop drawings and details based on the Contract Documents submitted to the Architect for review. Include plans, elevations, sections, full-size details, and attachments to other work. Show connection to and continuity with adjacent thermal, weather, and air barriers.

D. Samples for initial Selection: Manufacturer's standard color selector sheets or factory applied selector plates. Website or print media other than Manufacturer's provided materials do not represent accurate color renditions and are not acceptable.

E. Samples for verification:
   1. Submit three samples of each required aluminum finish on aluminum plates or extrusions.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, door hardware, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware. Submit for concurrent review with other door and hardware submittals.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront. Compliant with local code requirements and as specified herein, whichever is more stringent.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency, or by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Fabricator and Installer: Shall have a minimum of 5 years experience on projects of similar size and scope. Installer shall be approved by Manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate typical construction and waterproofing details, and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Incorporate storefront framing opening into mockup panel described elsewhere in these specifications, featuring typical exterior materials.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after curtain wall installation.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 GUARANTEE AND WARRANTY

A. Installer shall submit a written guarantee to the Owner, guaranteeing storefront system for a period of 2 years against leaks and defects in the system.

B. Door manufacturer's warranty shall provide for a period of 10 years from date of Substantial Completion. All hardware installed by manufacturer shall be covered by warranty.

C. Manufacturer's Finish Warranty: Manufacturer's standard limited warranty against fade, chalk, crack, check, peel, and failure of coatings to adhere to metal. Warranty duration as follows:
   1. Anodic Finish: 10 years from date of delivery.

1.11 MAINTENANCE MATERIALS

A. Entrance Door Hardware:
   1. 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 entrance door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Exterior Storefront: 2 3/4" x 5" storefront glazing system, thermally broken at exterior. Subject to compliance with requirements, provide IR501T system as manufactured by Kawneer Company, or comparable product by one of the following:
   1. Oldcastle Building Envelope.
   2. Tubelite Company, Inc.

B. Interior Storefront: 1 3/4" x 4” storefront glazing system, center plane glass, non-thermal. Subject to compliance with requirements, provide Trifab 400 system as manufactured by Kawneer Company, or comparable product by one of the following:
   1. Oldcastle Building Envelope.
   2. Tubelite Company, Inc.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.03 FRAMING SYSTEMS

A. Framing Members and Brake Metal Fillers: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken at exterior framing, non-thermal broken at building interior.
2. Glazing Plane: Center.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.04 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.05 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: Minimum of 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members, with glazing pockets sized for specified insulated glazing. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch nominal width.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

B. Entrance Door Hardware: Factory install entrance door hardware provided by Manufacturer to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes
   1. Weather-stripping / gasketing: Manufacturer's standard replacement stripping of molded neoprene gaskets complying with ASTM D-2000. At exterior doors, provide compression weather stripping. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
   2. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
   3. Refer to Division 08, Section "Door Hardware" for more information.
   4. Reinforce doors as required for installing entrance door hardware.

2.06 ACCESSORY MATERIALS

A. Aluminum Trim: Provide brake metal trim in locations specifically shown in Drawings and other locations as required for complete installation. Thicknesses indicated in Drawings and specifications are minimum thicknesses regardless of minimum thickness to prevent oil canning. Provide greater thickness than indicated minimum thicknesses where required to prevent oil canning. Contractor is responsible to determine required thicknesses per delegated design requirements (refer to Part 1 of these specifications).

B. Anchoring Devices: Provide plates, angles, steel frame bracing, wind bracing, spacers, clips and other devices necessary to support aluminum framing and glass. Design of connections shall be fabricator's responsibility. Submit shop drawing for approval.

C. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.07 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Profiles with solid back extrusions, or with filler plates, as required to receive membrane flashings at jamb flashings (locations where metal jamb flashing is not otherwise indicated).
   3. Accurately fitted joints with ends coped or mitered.
   4. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   5. Physical and thermal isolation of glazing from framing members.

6. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
7. Provisions for field replacement of glazing from exterior.
8. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 ALUMINUM FINISHES

A. Clear or Color Anodic Finish: AA-M12C22A31/A32/A34, AAMA 611, Architectural Class I Clear Anodic Coating. Class II for interior storefront.
1. Color: Clear anodized.

B. Miscellaneous Steel Bracing (Concealed): One (1) shop coat of red oxide primer.

C. Source Quality Control: Representative samples of color anodized finish shall meet or exceed following tests: ASTM B224, thickness of coating; and ASTM B117, neutral salt spray.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.

3.03 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
   1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
      b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.04 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.05 PROTECTION AND CLEANING

A. Protect aluminum framing and/or doors during construction by masking members with approved cardboard and paper as recommended by manufacturer. Take particular care in protecting openings and doors from damage during construction.

B. Upon completion, remove trimmings and other debris. Replace broken, scratched, chipped or other damaged glazing. Remove excessive sealant, mastic and other marks from adjacent surfaces, and wash with clean water. Cleaning of glazing must be done in strict compliance with manufacturer's recommendations.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.

END OF SECTION 08 41 13

SECTION 08 71 00 - DOOR HARDWARE

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. Section Includes:
   1. Door hardware, including electric hardware.
   2. Storefront and entrance door hardware.
   3. Wall or floor-mounted electromagnetic hold-open devices.
   4. Power supplies for electric hardware.
   5. Cylinders for doors fabricated with locking hardware.
   6. Key cabinets.

B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry.”
   2. Division 7 Section “Joint Sealants”
   3. Division 8 Section “Aluminum Entrances.”
   4. Division 8 Section “Metal Doors and Frames.”
   5. Division 8 Section “Wood Doors.”
   6. Division 10 Section “Signage.”

1.03 REFERENCES

A. Use date of standard in effect as of Bid date.
   1. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
      a. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people.
      b. ANSI A156.18 Materials and Finishes
   2. ADA – Americans with Disabilities Act of 1990 BHMA – Builders Hardware Manufacturers Association
   3. DHI – Door and Hardware Institute
   4. NFPA – National Fire Protection Association
      a. NFPA 80 – Fire Doors and Windows
      b. NFPA 105 – Smoke and Draft Control Door Assemblies
      c. NFPA 252 – Fire Tests of Door Assemblies
   5. UL – Underwriters Laboratories
      a. UL10C – Positive Pressure Fire Tests of Door Assemblies.
      b. UL 305 – Panic Hardware
   6. WHI – Warnock Hersey Incorporated
   7. Local applicable codes
   8. SDI – Steel Door Institute
   9. WI – Woodwork Institute
   10. AWI – Architectural Woodwork Institute
   11. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations
   1. Manufacturers: see table at 2.1.A of this section
   2. Finishes: see 2.7 of this section.

1.04 SUBMITTALS

A. SUBMITTALS: Submit electronic copy of schedule per Division 01. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information:
   1. Type, style, function, size, quantity and finish of hardware items.
   2. Use BHMA Finish codes per ANSI A156.18.
   3. Name, part number and manufacturer of each item.
   4. Fastenings and other pertinent information.
   5. Location of hardware set coordinated with floor plans and door schedule.
   6. Explanation of abbreviations, symbols, and codes contained in schedule.
   7. Mounting locations for hardware.
   8. Door and frame sizes, materials and degrees of swing.
   9. List of manufacturers used and their nearest representative with address and phone number.
   10. Catalog cuts.
   11. Point-to-point wiring diagrams.
   12. Manufacturer's technical data and installation instructions for electronic hardware.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 01. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

H. Contractor is to reject any hardware submittal that does not meet door manufacturer's TDI/Windstorm assembly testing requirements. If the specified hardware does not meet the manufacturer's tested assembly requirements, then the contractor is to either augment the hardware as appropriate to meet the door manufacturer's requirements, or is to provide a door manufacturer in which the specified hardware is tested.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
      a. Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C Standard 7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: coordinate delivery to appropriate locations (shop or field).
   1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.07 PROJECT CONDITIONS AND COORDINATION

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
   1. Location of embedded and attached items to concrete.
   2. Location of wall-mounted hardware, including wall stops.
   3. Location of finish floor materials and floor-mounted hardware.
   4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
   5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

6. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
7. Manufacturers' templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations: segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.08 WARRANTY

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:
1. Extra Heavy Duty Cylindrical Lock: Seven Years
2. Exit Devices: Three years mechanical, One year electrical
3. Closers: Thirty years 4040XP, Twenty Five years 1450
4. Hinges: One year
5. Other Hardware: Two years

1.09 COMMISSIONING

A. Conduct these tests prior to request for certificate of substantial completion:
1. With installer present, test door hardware operation with climate control system and both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers and their abbreviations used in this schedule:
1. B/O By Others
2. GLY Glynn-Johnson Hardware
3. IVE H. B. Ives
4. KNC KN Crowder
5. LCN LCN Closers
6. SCE Schlage Electronics
7. SCH Schlage Lock Company
8. VON Von Duprin
9. YAL Yale
10. ZER Zero International

2.02 HINGING METHODS

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds

the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
   1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
   2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:
   1. Geared-type aluminum.
      a. Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
      b. If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powdercoat finishes subject to Architect approval.

2.03 LOCKSETS, LATCHES, DEADBOLTS

A. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.
   1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
   2. Locking Spindle: stainless steel, integrated spring and spindle design.
   3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
   4. Latchbolt: solid steel.
   5. Backset: 2.75 inches typically, more or less as needed to accommodate frame, door or other hardware.
   6. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2.00 inches clearance from lever mid-point to door face.
   7. Electric operation: Manufacturer-installed continuous duty solenoid.
   8. Strikes: 16 gage curved steel, bronze or brass with 1.00 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
   9. Scheduled Lock Series and Design: Schlage ND series, RHO design.
   10. Certifications:
      a. ANSI A156.2, 1994, Series 4000, Grade 1.
      b. UL listed for A label and lesser class single doors up to 4 feet x 8 feet.
   11. Accepted substitutions: Falcon T, Sargent 11 Line.

2.04 EXIT DEVICES / PANIC HARDWARE

A. General features:
   1. Independent lab-tested 1,000,000 cycles.
   2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
   3. Deadlocking latchbolts, 0.75 inch projection.
   4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
   5. No exposed screws to show through glass doors.
   6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
   7. Releasable in normal operation with 15-pound maximum operating force, and with 32-pound maximum pressure under 250-pound load to the door.

8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.

B. Specific features:
   1. Non-Fire Rated Devices: hex dogging.
   2. Lever Trim: breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.
   3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
   4. Fire-Labeled Devices: UL label indicating “Fire Exit Hardware”. Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
   5. Impact recessed devices: 1.25 inch projection when push-pad is depressed. Sloped metal end caps to deflect carts, etc. No pinch points to catch skin between touchbar and door.
   6. Delayed Egress Devices: Function achieved within single exit device component, including latch, delayed locking device, request-to-exit switch, nuisance alarm, remote alarm, key switch, indicator lamp, relay, internal horn, door position input, external inhibit input plus fire alarm input. NFPA 101 “Special Locking Arrangement” compliant.
   7. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
   8. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
   9. Exit Device meeting this specification: Von Duprin 33A/99.
   10. Accepted substitutions: Precision 2000, Sargent 8000.

2.05 POWER SUPPLIES / TRANSFERS / CO ELECTRONIC LOCKS

A. Power supplies to be tested and certified to meet UL294.

B. Universal 120-240 VAC input, low voltage DC output, regulated and filtered.

C. Power supplies to have 2A, 4A, 6A output, 12/24 VDC field selectable with jumper.

D. Provide emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.

E. Power supplies shall be flat mounting design with polarized locking connections for additional option boards as specified.

F. Provide a means to transfer power from the door frame to door style. Devices shall be reversible and allow a full 180 degree door swing. When door is closed transfer unit shall be concealed.

G. Provide Von Duprin EPT power transfers with swiveling stainless steel tube at all electrified locks and exit devices. Von Duprin EPT shall be used at all exits that require a high amp inrush to retract latch. Power transfer hinges or coiled spring power transfers will not be acceptable.

H. Provide Allegion Connect connectors as scheduled, at all electrified door hardware in type and lengths required to connect to power supply.

I. Schlage Electronic Locksets, CO series (Proprietary - No Substitution)

J. Lockset to meet or exceed ANSI Standard A156.25 and A156.2 Series 4000, Grade 1 strength and operational requirements.

K. Lockset listed to UL294.

L. Lockset to meet or exceed ANSI/BHMA A156.25 Grade 1 Operation and Security Requirement.

M. Lockset certified to UL10C, FCC Part15 and be compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80.

N. Lockset powered by four AA batteries. Options: Eight AA batteries or a 12V or 24V DC power supply for AD series.

O. Lockset to have ability to communicate Battery Status.

P. Finish:

Q. 619(Satin Nickel) 626(Satin Chrome) 626AM(Satin Chrome with Antimicrobial).

R. The lockset will have the ability to utilize emergency mechanical key override.

2.06 CLOSERS

A. Surface Closers: Where scheduled at exterior locations.
   1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
   2. ISO 2000 certified. Units stamped with date-of-manufacture code.
   3. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
   4. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
   5. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
   6. Extra-duty arms (EDA) solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers with parallel arm units at doors scheduled with parallel arm units.
   7. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
   8. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
   9. Non-flaming fluid, will not fuel door or floor covering fires.
   10. Pressure Relief Valves (PRV) not permitted.
   11. Closer meeting this specification: LCN 4040XP

B. Surface Closers: Where scheduled at interior locations.
   1. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
   2. Non-sized, non-handed and adjustable. Place closers inside building, stairs, and rooms.
   3. Plates, brackets, and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
   4. Exterior door closers: tested to 100 hours of ASTM B117 Salt Spray Test, furnish data on request.
   5. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
   6. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
   7. Closer Body: 1-1/4 inch (32mm) diameter, with 5/8 inch (16mm) diameter heat-treated pinion journal and full complement bearings.
   8. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.

9. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
10. Pressure Relief Valve (PRV) Technology: Not Permitted.
11. Closer meeting this specification: LCN 1450
12. Accepted substitutions: Falcon SC80, Norton 8000.

2.07 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.

B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops: Provide stops to protect walls, casework or other hardware.
   1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.

E. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

F. Seals: Adhesive type at head & jambs. Inelastic, rigid back, not subject to stretching. Self-compensating for warp, thermal bow, door settling, and out-of-plumb.
   1. Proposed substitutions: submit for approval.

G. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

H. Thresholds: As scheduled and per details. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
   1. Saddle thresholds: 0.200 inches minimum thickness.

I. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

J. Fire-rated openings, 3-hour duration: Thresholds, where scheduled, to extend full jamb depth.

K. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.

L. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

M. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

N. Through-bolts: Verify with Architect. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
   1. Exception: surface-mounted overhead stops, holders, and friction stays.

O. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent: door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal.

P. Key Control Software: Same manufacturer as key cylinders, supply to Owner.

Q. Wall- & Floor-mounted electromagnetic door holders: LCN's SEM series or approved equivalent. Incorporate into U.L. listed fire & life-safety system, doors release to allow closure and latching when door's zone is in alarm state. Use minimum projection required to allow door to open as widely as allowed by wall conditions and projection of door hardware.

2.08 FINISH

A. Generally: BHMA 626 Satin Chromium Steel OR BHMA 630 Satin Stainless Steel.
   1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.
   1. Provide satin-chrome plated arms, tracks and covers where scheduled bright metallic powder coat (MTLPC) not available.

C. Finish designators used in appended hardware schedule:

ANSI	US	Description	Base Metal
600	USP	Primed For Painting	Steel
626	US26D	Satin Chromium Plated Over Nickel	Brass, Bronze
626AM	US26D	Satin Chromium Plated Over Nickel With Antimicrobial Coating	Brass, Bronze
628	US28	Satin Aluminum, Clear Anodized	Aluminum
630	US32D	Satin Stainless Steel	Stain. Steel 300 Ser
652	US26D	Satin Chromium Plated Over Nickel	Steel
689	US28	Aluminum Painted	Any
AL	US28	Aluminum Mill Finish	Aluminum
BLK		Black	Any
BRN		Dark Brown	Any
CL		Clear Anodized	Aluminum
GRY		Grey	Any

D. Seal color to be as selected by Architect.

2.09 KEYING REQUIREMENTS

A. Key System: Schlage Everest 29 patented keyway, small format interchangeable core. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway(s) and structure and keybow styles, furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner.
   1. New factory registered master key system.

B. Construction keying: furnish brass keyed-alike temporary cores plus 10 operating keys and 2 construction control keys. Temporary cores and keys remain property of hardware supplier.

C. Contractor will install permanent cylinders/cores.

D. Interchangeable Cores: furnish utility patented, 7-pin solid brass construction.

E. Locksets and cores: keyed at factory of lock manufacturer where permanent records are maintained.

F. Permanent keys and cores: use secured shipment direct from point of origination to Owner.
   1. For estimate: 2 keys per lockset, 5 master keys per group, 5 grand-master keys, 3 control keys.

G. For estimate: VKC stamping plus “DO NOT DUPLICATE”.

H. Bitting List: use secured shipment direct from point of origination to Owners upon completion.

2.10 KEY CONTROL SYSTEM

A. Provide a Telkee (302) 678-7800 key control system, or equivalent by Lund Equipment Co., Inc., Cleveland, OH (Tel) 330-6594800. Include envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal wall cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project. Hardware supplier to assist Owner in setting up key control system. Organize keys by room, by master, grand master and key blanks, in key envelopes with neatly marked room numbers, as determined at key meeting.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. A. Can read and understand manufacturers’ templates, suppliers’ hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers’ furnished fasteners. Available to meet with manufacturers’ representatives and related trades to discuss installation of hardware.

3.02 PREPARATION

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
   1. Notify Architect of code conflicts before ordering material.
   2. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 1133B.2.5.2.
   3. Locate panic hardware between 36 inches to 44 inches above the finished floor.
   4. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.03 INSTALLATION

A. Install hardware per manufacturer’s instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

E. Install closers inside building, stairs, and rooms as scheduled.

F. Drill pilot holes for fasteners in wood doors and/or frames.

G. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.04 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner’s satisfaction.
2. Adjust doors to fully latch with no more than 1 pound of pressure.
3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
4. Adjust door closers per 1.9 this section.

B. Fire-rated doors:
1. Wood doors: adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors: adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

C. Adjust closers to meet ADA

D. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner’s personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

3.05 DEMONSTRATION

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.06 PROTECTION / CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.07 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

Hardware Group No. 001

Provide each RU door(s) with the following:

ALL HARDWARE BY COILING DOOR SUPPLIER.

Hardware Group No. 002

Provide each CO door(s) with the following:

CASED OPENING. NO HARDWARE REQUIRED.

Hardware Group No. 003

Provide each SL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	HANGER KIT	CRT-101 COMPLETE KIT	AL	KNC
2	EA	LONG DOOR PULL	PR 9266 36" 20" P	630	IVE

Hardware Group No. 103

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53HD RHO	626	SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

Hardware Group No. 303

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

Hardware Group No. 503

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO	626	SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

Hardware Group No. 701R

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD/224HD AS REQ'D	628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-F-06	626	VON
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA X SPCR AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

Hardware Group No. 801

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD/224HD AS REQ'D	628	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	1450 RW/PA X SPCR AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

Hardware Group No. A801

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD/224HD AS REQ'D	628	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	AUTO OPERATOR	BY DIVISION 08 71 13		B/O
2	EA	ACTUATOR	BY DIVISION 08 71 13		B/O
1	EA	PA MOUNTING PLATE	1450-18/18PA (AS REQ'D)	689	LCN
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

OPERATIONAL DESCRIPTION: FREE ENTRY AND EGRESS. PRESSING EITHER ACTUATOR TO INITIATE AUTO OPERATOR.

Hardware Group No. AK714A

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	112HD/224HD EPT AS REQ'D (OR AS TESTED BY DOOR MFR)	628	IVE
2	EA	POWER TRANSFER	EPT10 CON (OR AS TESTED BY DOOR MFR)	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-HH-(KAW)-9947-EO-CON (OR AS TESTED BY DOOR MFR)	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-HH-(KAW)-9947-NL-OP-110MDCON (OR AS TESTED BY DOOR MFR)	626	VON
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	90 DEG OFFSET PULL	8190EZHD 12" O (OR AS TESTED BY DOOR MFR)	630	IVE
1	EA	AUTO OPERATOR (BOTH LEAFS)	AS TESTED - BY DIVISION 08 71 13		B/O
2	EA	ACTUATOR	BY DIVISION 08 71 13		B/O
2	EA	FLOOR STOP	FS18L	BLK	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O
1	EA	MEETING STILE	MEETING STILES BY DOOR MNFR		B/O
2	EA	DOOR SWEEP	39A (OR AS TESTED BY DOOR MFR)	A	ZER
1	EA	THRESHOLD	655A-V3-223 (OR AS TESTED BY DOOR MFR)	A	ZER
2	EA	HARNESS (CON TO EPT)	CON (LENGTH AS REQ)		SCH
2	EA	HARNESS (EPT TO DEVICE)	CON (LENGTH AS REQ)		SCH
2	EA	HARNESS (POWER SUPPLY TO CON)	CON-6W		SCH
2			DOOR CONTACT(S) - WORK OF DIVISION 28		
1			KEYPAD - WORK OF DIVISION 28		
1			POWER SUPPLY - WORK OF DIVISION 28		

NOTE: ALL HARDWARE SPECIFIED TO MEET WINDSTORM TESTING REQUIREMENTS AROUND KAWNEER 500IR SERIES, WIDE STILE DOOR. SUBCONTRACTOR TO MODIFY HARDWARE OR DOOR MANUFACTURER/SERIES IN ORDER TO MEET TDI ASSEMBLY TESTING REQUIREMENTS.

OPERATIONAL DESCRIPTION: WHEN DOORS ARE ELECTRONICALLY UNLOCKED DURING DAY HOURS, EXTERIOR ACTUATOR TO INITIATE AUTO OPERATOR. WHEN DOORS ARE LOCKED, KEYPAD TO SEQUENTIALLY INITIATE ELECTRIC LATCH RETRACTION AND AUTO OPERATOR. DURING AFTER-HOURS, DOORS ARE TO BE LOCKED AND EXTERIOR ACTUATOR TO BE DISABLED BY ACCESS CONTROL SYSTEM. FREE EGRESS AT ALL TIMES. PRESSING INTERIOR ACTUATOR TO SEQUENTIALLY INITIATE ELECTRIC LATCH RETRACTION AND AUTO OPERATOR.

Hardware Group No. DK201HR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	CO-100-CY-70-KP-RHO-BD (@ BOTTOM LEAF)	626	SCE
1	EA	AUXILIARY LATCH	YSSL10 - THUMB TURN ONLY (INSTALLED @ TOP LEAF; LATCH INTO BOTTOM LEAF)	626	YAL
1	EA	SFIC CONST. CORE	80-035		SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SURFACE CLOSER	1450 EDA X SPCR AS REQ (@ TOP LEAF - TO SWING 180 DEG)	689	LCN
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D) (@ BOTTOM LEAF)	626	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7850 (@ TOP LEAF)	689	LCN
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O
1	EA	MEETING STILE	44STST	STST	ZER

NOTES:
1. MAG HOLD OPEN TO TIE INTO FIRE ALARM SYSTEM.
2. ASTRAGAL TO BE INSTALLED ONTO PULL-SIDE OF TOP LEAF SO THAT THE TOP LEAF CAN CLOSE THE BOTTOM LEAF.
3. MAXIMUM OF 1/8" GAP BETWEEN THE TWO LEAFS IN ORDER FOR AUXILIARY LATCH TO PROPERLY OPERATE AND MEET FIRE-RATING REQUIREMENTS.

OPERATIONAL DESCRIPTION: ENTRY BY KEYPAD OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES. LOCK IS FAIL-SECURE. MAG HOLD OPEN TO RELEASE UPON FIRE ALARM.

Hardware Group No. K201

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	CO-100-CY-70-KP-RHO-BD	626	SCE
1	EA	SFIC CONST. CORE	80-035		SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA X SPCR AS REQ	689	LCN
1	EA	FLOOR/WALL STOP	FS436/WS406CCV (AS REQ'D)	626	IVE
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

OPERATIONAL DESCRIPTION: ENTRY BY KEYPAD OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES. LOCK IS FAIL-SECURE.

Hardware Group No. K205

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD/224HD EPT AS REQ'D (OR AS TESTED BY DOOR MFR)	628	IVE
1	EA	POWER TRANSFER	EPT10 CON (OR AS TESTED BY DOOR MFR)	689	VON
1	EA	STOREROOM LOCK	ND80HDEU RHO N123-062 CON	626	SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA X SPCR AS REQ'D (OR AS TESTED BY DOOR MFR)	689	LCN
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O
1	EA	THRESHOLD	566A-223 (OR AS TESTED BY DOOR MFR)	A	ZER
1	EA	HARNESS (CON TO EPT)	CON (LENGTH AS REQ)		SCH
1	EA	HARNESS (EPT TO DEVICE)	CON (LENGTH AS REQ)		SCH
1	EA	HARNESS (POWER SUPPLY TO CON)	CON-6W		SCH
1			DOOR CONTACT(S) - WORK OF DIVISION 28		
1			KEYPAD - WORK OF DIVISION 28		
1			POWER SUPPLY - WORK OF DIVISION 28		

NOTE: ALL HARDWARE SPECIFIED TO MEET WINDSTORM TESTING REQUIREMENTS AROUND STEELCRAFT DOOR. SUBCONTRACTOR TO MODIFY HARDWARE OR DOOR MANUFACTURER/SERIES IN ORDER TO MEET TDI ASSEMBLY TESTING REQUIREMENTS.

OPERATIONAL DESCRIPTION: ENTRY BY KEYPAD OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES.

Hardware Group No. K207

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	CO-100-CY-70-KP-RHO-BD	626	SCE
1	EA	SFIC CONST. CORE	80-035		SCH
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	1450 RW/PA X SPCR AS REQ (SPECIAL TEMPLATE AS REQ)	689	LCN
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O

OPERATIONAL DESCRIPTION: ENTRY BY KEYPAD OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES. LOCK IS FAIL-SECURE.

Hardware Group No. K715

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD/224HD EPT AS REQ'D (OR AS TESTED BY DOOR MFR)	628	IVE
1	EA	POWER TRANSFER	EPT10 CON (OR AS TESTED BY DOOR MFR)	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-HH-99-L-NL-06-299F-CON	626	VON
1	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA X SPCR AS REQ'D (OR AS TESTED BY DOOR MFR)	689	LCN
1		SEALS	PERIMETER SEALS BY FRAME MNFR		B/O
1	EA	THRESHOLD	566A-223 (OR AS TESTED BY DOOR MFR)	A	ZER
1	EA	HARNESS (CON TO EPT)	CON (LENGTH AS REQ)		SCH
1	EA	HARNESS (EPT TO DEVICE)	CON (LENGTH AS REQ)		SCH
1	EA	HARNESS (POWER SUPPLY TO CON)	CON-6W		SCH
1			DOOR CONTACT(S) - WORK OF DIVISION 28		
1			KEYPAD - WORK OF DIVISION 28		
1			POWER SUPPLY - WORK OF DIVISION 28		

NOTE: ALL HARDWARE SPECIFIED TO MEET WINDSTORM TESTING REQUIREMENTS AROUND STEELCRAFT DOOR. SUBCONTRACTOR TO MODIFY HARDWARE OR DOOR MANUFACTURER/SERIES IN ORDER TO MEET TDI ASSEMBLY TESTING REQUIREMENTS.

OPERATIONAL DESCRIPTION: ENTRY BY KEYPAD OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES.

END OF SECTION 08 71 00

SECTION 08 71 13 - AUTOMATIC DOOR OPERATOR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following types of automatic door operators:
   1. Exterior and interior, automatic door operators, low energy, with bottom load headers and surface mounting.
   2. Automatic door operators shall be configured for doors as follows:
      a. Simultaneous pair, out swing.
      b. Single door, out swing

B. Related Sections:
   1. Division 08 Section - “Aluminum Entrances and Storefront”
   2. Division 08 Section - “Flush Wood Doors”
   3. Division 08 Section - "Door Hardware" for hardware to the extent not specified in this Section.

1.03 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. Underwriters Laboratories (UL):
   1. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

C. American National Standards Institute (ANSI)/Builders’ Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
   2. ANSI/BHMA A156.19: Standard for Power Assist and Low Energy Power Operated Doors.

D. American Society for Testing and Materials (ASTM):
   1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

E. Builders’ Hardware Manufacturers Association (BHMA):
   1. BHMA A156.10 - Standard for Power Operated Pedestrian Doors.

F. American Association of Automatic Door Manufacturers (AAADM):

G. National Fire Protection Association (NFPA):
   1. NFPA 101 - Life Safety Code.
   2. NFPA 70 - National Electric Code.

H. International Conference of Building Officials (ICBO):
   1. UBC 1997: Uniform Building Code

I. California Department of Forestry and Fire Protection, Office of the State Fire Marshall.

J. International Standards Organization (ISO):
   1. ISO 9001 - Standard for Manufacturing Quality Management Systems

K. National Association of Architectural Metal Manufacturers (NAAMM):
   1. Metal Finishes Manual for Architectural and Metal Products.

L. American Architectural Manufacturers Association (AAMA):
   1. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
   2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

1.04 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

1.05 PERFORMANCE REQUIREMENTS

A. Provide automatic door operators capable of withstanding structural loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Operating Range: Minus 30 deg F (29 deg C) to 130 deg F (54 deg C).

C. Opening-Force Requirements for Egress Doors: In the event power failure to the operator, swinging automatic entrance doors shall open with a manual force, not to exceed 30 lbf (133 N) applied at 1” (25 mm) form the latch edge of the door.

D. Break Away Requirements: Automatic door operators shall breakaway with no more than 50 lbf (222 N) applied at 1” (25 mm) from the latch edge of the door.

E. Door Energy: The kinetic energy of a door in motion shall not exceed 1.25 lbf-ft (1.69 Nm).

F. Closing Time:
   1. Doors shall be field adjusted to close from 90 degrees to 10 degrees in 3 seconds or longer.
   2. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.

1.06 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 01 submittal procedures.

B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work. Indicate wiring for electrical supply.

C. Color Samples for selection of factory-applied color finishes.

D. Closeout Submittals: Provide the following with project close-out documents.
   1. Owner’s Manual.
   2. Warranties.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001 and with company certificate issued by AAADM.

C. Certifications: Automatic door operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
   1. ANSI A156.10.
   2. NFPA 101.
   3. UL 325 Listed (Fire Door Operator)
   4. ICBO (UBC Standard 10-1).
   5. California Department of Forestry and Fire Protection, Listed.

D. Source Limitations: Obtain automatic door operators through one source from a single manufacturer.

E. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic door operators and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

F. Power Operated Door Standard: ANSI/BHMA A156.19.

G. 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.

H. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for swinging automatic entrance doors serving as a required means of egress.

1.08 PROJECT CONDITIONS

A. Field Measurements: General Contractor shall verify openings to receive automatic door operators by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

C. Other trades: General Contractor Advise of any inadequate conditions or equipment.

1.09 COORDINATION

A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to, power supplies, and remote activation devices.

C. System Integration: Integrate automatic door operators with other systems as required for a complete working installation.
   1. Provide electrical interface control capability for card reader or keypad operation of automatic door operators on doors with electric locking.
   2. Where required for proper operation, provide a time delay relay to signal automatic door operator to activate only after electric lock system is released.

1.10 WARRANTY

A. Automatic door operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.01 AUTOMATIC DOOR OPERATORS

A. Manufacturer: Stanley Access Technologies; Magic-Force™ Series automatic door operator, or approved equal.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Headers: 6063-T6.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Sheet and Plate: ASTM B 209.

B. Sealants and Joint Fillers: Refer to Division 07 Section "Joint Sealants".

2.03 COMPONENTS

A. Header Case: Header case shall not exceed 6 inch by 6 inch (114 mm by 152 mm) in section and shall be fabricated from extruded aluminum designed to conceal door operators and controls. The operator shall be sealed against dust, dirt, and corrosion within the header case. Access to the operator and electronic control box shall be provided by from the bottom by a removable cover. Removable cover shall be secured in place by screws.

B. Door Arms: Door arms shall be manufacturer's standard units designed specifically for use with automatic door operators provided.
   1. Visible Arms: A combination of door arms and linkage shall provide positive control of door through entire swing; units shall permit use of butt hung, center pivot, and offset pivot-hung doors.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

D. Signage: Provide signage in accordance with ANSI/BHMA A156.19.

2.04 SWINGING DOOR OPERATORS

A. Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Electromechanical Operators: Self-contained unit powered by a minimum 3/16 horsepower, permanent-magnet DC motor; through a high torque reduction gear system.
   1. Operation: Power opening and spring closing.
   2. Operator Type: Low energy; readily convertible to full energy; no tools required to change type.
   3. Handing: Non-handed; no tools required to change handing.
   4. Capacity: Rated for door panels weighing up to 350 pounds.
   5. Mounting: Surface applied.
   6. Features:
      a. Adjustable opening and closing speeds.
      b. Adjustable opening and closing force.
      c. Adjustable back-check.
      d. Adjustable hold-open time between 0 and 30 seconds.
      e. Reverse on obstruction.

f. Variable rate open/closed speed control.
g. Closed loop speed control with active braking and acceleration.
h. Variable obstruction recycle time delay.
i. Optional Switch to open/Switch to close operation.
j. When operators are provided in pairs, adjustable features are independently adjustable for each operator.

C. Field Adjustable Spring Closing Operation: The operator shall close the door by spring energy employing the motor, as a dynamic brake to provide closing speed control. The closing spring shall be a helical compression spring, adjustable for positive closing action. The spring shall be adjustable to accommodate a wide range of field conditions.

D. Independent Adjustable Closing and Latching Speed Control: The operator shall employ a rheostat module to allow for independent field adjustment of closing and latching speeds using the motor as a dynamic brake.

E. Field Adjustable Open Stop: The operator shall provide a field adjustable open stop to accommodate opening angles from 80 to 135 degrees without the need for additional components.

F. Consistent Cycle: The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open. Additionally, the range of the force shall be field adjustable to accommodate a wide range of on-site conditions.

G. Quiet Performance: The operator shall be designed to output audible noise ratios less than or equal to 50dba.

H. Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power. The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open.

I. Electrical service to door operators shall be minimum service to be 120 VAC, 10 amps for doors with operators in pairs, 5 amps for single doors.

2.05 ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position. Systems utilizing external magnets and magnetic switches are not acceptable.

B. Life Cycle Data Counter: The microprocessor control shall incorporate a non-re-settable counter to track door operation cycles.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:
1. Automatic Reset Upon Power Up.
2. Main Fuse Protection.
3. Electronic Surge Protection.
4. Internal Power Supply Protection.
5. Resetable sensor supply fuse protection.
6. Software “Watchdog” protection in the case of software malfunction.

D. Push Button Interface with LED: The controller shall have push button switches with LED readout to allow for selection or change of the following parameters: carpet or timer logic, single or dual door, activation options, normal back check or large back check, push-to-open assist on/off.

E. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.

F. Safety Search Circuitry: Provide system to recycle the swinging panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

G. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be software driven and shall be utilized via Palm® handheld interface. The following parameters may be adjusted via the configuration tool.
   1. Operating speeds and forces as required to meet ANSI/BHMA A156.10.
   2. Adjustable and variable features as specified in 2.04, B., 6.
   3. Firmware update.
   4. Trouble Shooting
      a. I/O Status.
      b. Electrical component monitoring including parameter summary.
   5. Entrance profile copy/paste.
   6. Software for local configuration tool shall be available as a free download from the automatic door operators' manufacturer's internet site.

H. Emergency Breakout Switch: A cam actuated emergency breakout switch shall be provided to disconnect power to the motor when an in-swinging door is manually pushed in the emergency out direction. The operator will then automatically reset and power will be resumed.

I. Control Switch: Automatic door operators shall be equipped with a three position function switch to control the operation of the door. Control switch shall provide three modes of operation, Automatic, Off, and Hold-Open.

J. Power Switch: Automatic door operators shall be equipped with a two position On/Off switch to control power to the door.

2.06 ACTIVATION DEVICES

A. Activation for Low Energy Doors as manufactured by Wikk Industries, Inc. and supplied by Stanley:
   1. Push Plates: Provide 6 inch (114 mm) square push plates with UL listed switch. Face plates and mounting studs shall be stainless steel. Face plates shall be engraved with the international symbol for accessibility and "Push To Open" with Black infill. Finish: Dark Oxidized Satin Brass, Oil Rubbed. Mount shall be fully recessed.
   2. Interior push plates shall be wall mounted in single or double gang electrical boxes and hardwired to door operator controls.
   3. Exterior push plates shall be wall mounted in single or double gang electrical boxes and hardwired to door operator controls.

2.07 ALUMINUM FINISHES

A. Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.

B. Class I, Clear Anodic Finish: AA-M10C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.40 mils minimum complying with AAMA 611-98, and the following:
   1. AAMA 607.1

2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.
3. Color: Dark bronze anodized.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of swinging automatic entrance doors. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Mounting: Install automatic door operators/headers plumb and true in alignment with established lines and grades. Anchor securely in place.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set headers, arms and linkages level and true to location with anchorage for permanent support.

C. Door Operators: Connect door operators to electrical power distribution system.

D. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide weather tight installation.

3.03 FIELD QUALITY CONTROL

A. Testing Services: Factory Trained Installer shall test and inspect each swinging automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.04 ADJUSTING

A. Adjust door operators, controls, and hardware for smooth and safe operation, for weather-tight closure, and complying with requirements in ANSI/BHMA A156.19 by AAADM Certified Technician.

3.05 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation. Remove excess sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

END OF SECTION 08 71 13

SECTION 08 80 00 - GLAZING

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. Section Includes:
   1. Provide all glass and glazing as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications."
   2. Division 8, All "Door" and "Window" Sections.
   3. Division 8 Section "Aluminum Entrances and Storefront."

1.03 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 any insulating glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination material obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standards.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Review curtain wall and window shop drawings and submit acceptance of details as suitable for proposed glass products.

C. Submit 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view.

1.05 INFORMATIONAL SUBMITTALS:

A. Qualification Data.

B. Product Certificates: Certificate of Compliance for all glass products.
   1. Insulating Glass Certification: Submit data verifying compliance with IGCC, Class A level.

C. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants and other glazing materials.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Wind Pressure and Thermal Stress Analysis: Submit thermal stress analysis of glass where thermal stress may occur.

E. Sample Warranties: For special warranties.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
      a. Glass fabricator to have 10 years of experience and meet ANSI / ASQC Q9002 1994.
   2. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certified Glass Installer Program.
   3. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

B. Coordination: Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the inspecting and testing agency, Insulating Glass Certification Council.

D. Installation Criteria: FGJA "Glazing Manual", in addition to any other referenced standards.

E. Single Source fabrication responsibility: Fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

F. Mockups: Before glazing, build mockups for each glass product indicated below to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups using materials indicated for the completed work.
   1. Build mockups in combination with storefront mockup requirements.
   2. Build mockups with the glass to match glazing systems required for Project, including typical lite size, framing systems, and glazing methods:
   3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   4. Obtain Architect's approval of mockups before starting fabrication.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing material manufacturers and when glazing channel substrates are wet from rain, frost condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg

1.09 WARRANTY

A. Warranty for Insulating Units: Warranty sealed insulating glass units for minimum period of ten (10) years, with manufacturer's replacement guarantee, covering as minimum: Defective or failure of seal; material vision obstruction as result of dust collection or film formation between panels or other similar failure and the following specific conditions:
   1. Reflective glass whose reflective coating cracks, peels or discolors shall be replaced at no charge (material only) for minimum ten (10) year period beginning on date of Substantial Completion.

B. Laminated Glass Warranty: Laminated glass that delaminates shall be replaced at no charge for minimum 5 years beginning on the date of Substantial Completion.

C. Coated Glass Warranty: Provide a written 10-year warranty from the date of Substantial Completion for coated glass.

D. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.

E. Glazing installer shall coordinate glass and glazing installation with framing systems, and install glass and glazing in accordance with manufacturer's instructions, so that guarantee is maintained.

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Provide glass lites in the thickness and strengths (annealed or heat-treated) to meet or exceed the following criteria based on analysis of Project loads and in-service conditions. Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses complying with ASTM E 1300 and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
2. Minimum glass thickness of lites composed of annealed or heat-treated glass are selected so the worst-case probability of failure does not exceed the following:
    a. Eight (8) lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action.
    b. Specified Design Wind Loads: As indicated on the Structural Drawings
    c. Minimum Glass Thickness for Exterior Lites: Not less than 6mm
    d. Thickness of Tinted and Heat-Absorbing glass: Provide the same thickness of each tint color indicated throughout Project.
3. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
    a. For monolithic-glass lites heat treated to resist wind loads.
    b. For insulating glass.
    c. For laminated-glass lites.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    1. Temperature Change (Range): 120 deg F , ambient; 180 deg F, material surfaces.

D. 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 monolithic-glass lites, properties are based on units with lites 6 mm thick.
    2. For laminated-glass lites, properties are based on products of construction indicated.
    3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
    4. 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 .
    5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBNL WINDOW 6 computer program.
    6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
    7. Solar Optical Properties: NFRC 300.

E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II, or Category IV Risk Factor as indicated in glass schedule.
    1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

F. Insulating glass products are to be permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
    1. Insulating Glass Certification Council (IGCC).

G. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with enhanced-protection testing requirements in ASTM E 1996 for Wind Zone 3 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated

for use on Project and shall be installed in same manner as glazing indicated for use on Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.

2.02 GLASS PRODUCTS, GENERAL

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. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or in referenced standards.

1. GANA Publications
   a. GANA Glazing Manual
   b. Laminated Glazing Reference Manual
   c. Tempering Division - Engineering Standards Manual
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
5. LSGA Publications.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.03 MANUFACTURERS

A. Basis of Design Products: Basis of Design products are indicated in the Glass Schedule later in this section. Provide Basis of Design products, or equal products as approved by Architect.

B. Manufacturers: Subject to compliance with Requirements, Manufacturers offering products acceptable for use on this project include the following:

1. Oldcastle Building Envelope.
2. Guardian Glass SunGuard.
3. Pilkington North America.
4. Viracon, Inc.
5. Vitro Architectural Glass (Formerly PPG Ideascapes).

C. Fabricators for Insulating Glass Units:

1. Basis of Design Fabricator: Viracon, Inc..

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

E. Fabricators for Specialty Glass and Specialty Glass Units: As specified with individual glass type descriptions.

2.04 GLASS PRODUCTS

A. Flat Glass
   1. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
   2. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

B. Heat-strengthened float glass: ASTM C 1048, Kind HS (heat-strengthened glass), Type I, Quality-Q3.
   1. Class 1 (clear) or Class 2 (tinted) as indicated.
   2. Condition A (uncoated), unless otherwise indicated.

C. Fully tempered float glass: ASTM C 1048. Kind fully tempered (FT), Quality-Q3.
   1. Class 1 (clear) or Class 2 (tinted) as indicated.
   2. Condition A (uncoated), unless otherwise indicated.

D. Insulating-Glass Units: 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. ASTM E773 Seal Durability of Sealed Insulating Glass Units
   2. ASTM E774 Sealed Insulating Glass Units
   3. Sealed insulating glass units to be double sealed with a primary seal of black (or gray) polyisobutylene and a secondary seal of black (or gray) silicone.
   4. Lites shall be separated by an aluminum spacer with 3 bent corners and 1 keyed-soldered corner, or 4 bent corners and a straight butyl injected zinc plated steel straight key joint, to provide a hermetically sealed and dehydrated air space.
      a. Aluminum Spacer Finish: Manufacturer’s standard.

E. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
      a. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements of laminated glass, except that interlayer may vary from type indicated above.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

2.05 MISCELLANEOUS GLAZING MATERIALS

A. General: Select glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. 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.

2.06 GLAZING SEALANTS

A. Cleaners, Primers, and Sealers, General: Types shall be as recommended by sealant or gasket manufacturer, and as specified in other Sections.
   1. Structural Glazing Sealants: ASTM C1184, and as recommended by glazing system Manufacturer.
   2. In event of conflicts, the most restrictive requirements acceptable to glazing system Manufacturers shall prevail.

B. 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.

C. Compatibility: Compatible with one another and with other materials they 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.

D. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT, G, and A.
   1. Basis of Design Product: Sealant as recommended by wind-impact-resistant window system Manufacturer.
   2. Application: Wind-Impact-Resistant Glazing.

2.07 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.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   2. Temperature Change: 180 deg F, material surfaces.

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. Carefully inspect and verify all job site conditions and measurements.
   2. Verify prepared openings for glazing are correctly sized and within tolerance.
   3. Verify that a functioning weep system is present.
   4. Verify that the minimum required face and edge clearances are being followed.
   5. Verify effective sealing between joints of glass-framing members.

6. 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 leave visible marks in the completed Work.
7. Verify glazing channels are free of burrs, irregularities, and debris.
8. Verify glass is free of edge damage or face imperfections.
9. Inspect door and frames to determine that frames, sash, and stops are set true and straight. Sash rabbets and stops shall be clean and dry at time of glazing.

B. Do not proceed until unsatisfactory conditions have been corrected. Beginning installation constitutes acceptance of substrate / conditions.

3.02 PREPARATION

A. Provide glass manufacturer's recommended edge clearances when sizing glass.

B. Remove protective coatings from surfaces to be glazed.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrates indicated under the project conditions.
1. Clean glazing channels and other framing members receiving glass immediately before glazing.
2. Remove coatings not firmly bonded to substrates.
3. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.

D. Verify measurements of sash and openings at Project.
1. Dimensions shown or indicated are given only as a guide for estimating purposes, and actual size shall be determined by measurement of the actual openings. Accurately cut glass to fit openings with proper clearances and setting block height.

E. Coordinate with and check Shop Drawings furnished by other suppliers of Work affecting this Section to avoid field installation problems.

F. Before glazing metal sash, remove oil, lacquer, or other material to which the compound will not readily adhere or which will tend to delaminate from metal and cause a leak through the glazing seal.

3.03 GLAZING

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 "GANA Glazing Manual" and in other referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance,

C. 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.

D. Glazing to fit line in rabbet with all edges straight and true. Size substantially as shown on the drawings, however Contractor shall fill sash and openings as actually constructed whether more or less than sizes given.

E. Material installed in a full bed of sealant, tooling finished surfaces smooth.

F. Mirrors installed using mirror glazing angles, concealed clips and mirror setting mastic. Mastic applied on substrate in spot application, spacing and sizes as recommended by mirror manufacturer for use intended.

3.04 GLAZING INSTALLATION

A. General:
   1. Comply with glass fabricator's recommendations.
   2. Install in accordance with glass and frame manufacturer's instructions.
   3. Install plumb, level, square, true to line, and without warp or rack Provide all fasteners required for installation.
   4. Except where curtain wall, window, entrance or glass manufacturer recommends otherwise, comply with Flat Glass Marketing Association (FGMA) Sealant Manual and FGMA Glazing Manual.
   5. Material installed in a full bed of sealant, tooling finished surfaces smooth.
   6. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
   7. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
   8. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

B. Glazing to fit line in rabbet with all edges straight and true. Size substantially as shown on the drawings, however Contractor shall fill sash and openings as actually constructed whether more or less than sizes given.

C. Do not apply glazing materials at temperatures below manufacturer's recommendations or to damp or frosted surfaces. Apply glazing material according to the manufacturer's instructions using proper primers as required.

D. Set glass using neoprene setting blocks and spacers to insure proper edge clearance and uniform beads of compound. Clearances shall conform to FGMA Glazing Manual requirements. Center glass in glazing rabbets.
   1. Butt glazing requirements: Apply mildew resistant silicone sealant to flush depth of joint as indicated by sealant manufacturer.

E. 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.

F. Check openings to confirm proper clearance at perimeters and between glass and stops.
   1. Clean surfaces of rabbet (including stops) and surface of glass which will come into contact with sealant. Use solvents and methods which insure clean, dry surfaces without film or foreign material when sealant is placed.

G. Remove and replace glazing beads carefully to avoid marking or defacing any portion of frame, sash, or fastenings.
   1. Set glass in full bed of glazing tape or sealant. Clean glazing material after stops are installed. Clean excess compound, etc. from glass after setting in conformance with glass manufacturer's recommendations.
   2. If recommended prime surfaces prior to glazing.

H. Set glass with reams (waves) running horizontally. Set glass with factory attached labels in place.

I. Setting Blocks: Place setting blocks at locations recommended by glass manufacturer, generally between 1/4 points and 6 inches from corner, except at glazed doors.
   1. At glazed doors, provide one block at sill, located 3 inches up from edge of glass at hinge side; one block at hinge side jamb, located 3 inches up from lower edge of glass; one

block at head, located 3 inches from edge of glass at latch side of door; and, one block at jamb at lock side of door, located 3 inches down from edge of glass at top corner.
2. Use blocks of length required to properly support glass. Offset approximately 1 inch from shims.

J. Glass Installation in Steel (Hollow Metal) Frames:
1. Glaze frames using pre-shimmed tape on both sides. Firmly glaze in place with joints sealed, free of rattles.
2. Set glass on setting blocks with a full bed of sealant or glazing tape.

K. Glass Installation in Aluminum Frames:
1. Glaze aluminum frames using preformed EPDM elastomeric glazing extrusion separately or in combination with sealant and pre-shimmed glazing tape in compliance with aluminum frame supplier's recommendations.
2. Set glass on setting blocks as recommended by manufacturer.
3. Apply tape and/or sealant to produce uniform sight line even with frame.
4. Set glass in gaskets with corners sealed.

L. Glazing Sealant: Along entire bottom edge of light, and up at least 6 inches at each jamb, gun in continuous full bed of sealant to fill voids.
1. Fill entire space, full width of pane, full depth of glass, with sufficient sealant to form heel along inside face and edge of glass.
2. At other edges (top and sides) gun in continuous heel bead of sealant along edges of glass perimeter to set stop against and into, acting as fill between glass and stop.
3. Immediately after setting glass, at entire perimeter of glass, gun in sealant between stop and glass so space above spacer is completely filled, without voids.
4. Place sealant flush with daylight edge of stops, with slight watershed at exterior. Provide straight, smooth surface meeting at opening corners with sharp intersection.
5. Leave no sealant on exposed surfaces of stops and glass.

3.05 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.

3.06 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.

3.07 ADJUSTING AND CLEANING

A. Immediately after installation remove nonpermanent labels and clean surfaces.
   1. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

B. Glazing shall be protected from damage, and from contact with contaminating or harmful substances, during construction. 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.
   1. If, despite protection measures, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
   2. Contractor shall assume all responsibility for breakage and shall replace cracked, broken, scratched or otherwise defective glazing.

C. Glazing shall be carefully cleaned at time of final acceptance, removing all non-permanent labels, excess sealant, paint and other foreign substances. Wash glass as recommended in writing by glass manufacturer.

3.08 GLASS SCHEDULE

A. (Type 1) 1/4" Clear Float Glass

B. (Type 2) 1/4" Clear Fully-Tempered Float Glass

C. (Type 3) 3/4", 45-minute rated Fire-Rated Glass: Refer to Division 08, Section “Fire Resistant Glazing” for additional information.

D. (Type 4) 9/16” Impact Rated Glazing Units, heat strengthened where indicated and where required by code, tinted, Low-E:
   1. Basis of Design: Vitro Glazings (formerly PPG Ideascapes), Solarban 60.
      a. Tint Color: Gray.

E. (Type 5) 1 5/16” Impact Rated Insulated Glazing Units, heat strengthened where indicated and where required by code, tinted, Low-E:
   1. Basis of Design: Vitro Glazings (formerly PPG Ideascapes), Solarban 60.
      a. Tint Color: Gray.

F. (Type 6) 1 5/16” Impact Rated Insulated Glazing Units, heat strengthened where indicated and where required by code, tempered, tinted, Low-E:
   1. Basis of Design: Vitro Glazings (formerly PPG Ideascapes), Solarban 60.
      a. Tint Color: Gray.

END OF SECTION 08 80 00

SECTION 08 88 13 - FIRE-RESISTANT GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Retain or delete this article in all Sections of Project Manual.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Fire-protection-rated glazing.

1.03 DEFINITIONS

A. Retain terms that remain after this Section has been edited for a project.

B. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

C. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.04 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers and glass testing agency.

B. Product Certificates: For each type of glass and glazing product, from manufacturer.

C. Sample Warranties: For special warranties.

1.07 QUALITY ASSURANCE

A. 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.

1.08 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.

1.09 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.02 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.03 GLASS PRODUCTS, GENERAL

A. Safety Glazing Labeling: Permanently mark glazing with certification label of **the** manufacturer. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.04 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

C. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.05 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.

1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.

B. 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 permitted to be used in doors

or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.

C. Fire-Protection-Rated Tempered Glass: 3/4" thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.

2.06 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

C. 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.

D. 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.

2.07 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. 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.

C. 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.

2.08 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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.03 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. 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.

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 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.

H. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

I. 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.

J. 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.

3.04 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.

D. Install gaskets so they protrude past face of glazing stops.

3.05 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. 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 washaway from glass.

3.06 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. 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 as recommended in writing by glass manufacturer.

3.07 FIRE-PROTECTION-RATED GLAZING SCHEDULE

A. Glass Type 3: 3/4" 45-minute fire-protection-rated glazing; SuperLite II-XL 45 by SaftiFirst, or approved equal.

END OF SECTION 08 88 13

SECTION 09 21 00 - GYPSUM BOARD ASSEMBLIES

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. Section Includes:
   1. Provide gypsum drywall as shown on the drawings and as herein specified including but not limited to: Miscellaneous metal framing, suspended ceiling systems, gypsum drywall and finishing systems.

B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry.”
   2. Division 6 Section “Wood Framing.”
   3. Division 6 Section “Architectural Woodwork"
   4. Division 7 Section “Thermal Insulation.”
   5. Division 7 for additional requirements for fire stopping and sealants installed with gypsum board assemblies.
   6. Division 9 Section “Metal Support Systems.”
   7. Division 9 Section “Acoustical Insulation.”
   8. Division 9 Section “Painting.”
   9. Division 9 Sections, for coordination of tiling, wall base materials, and other finishes applied to gypsum board assemblies.
   10. Divisions 10 and 11, and other Sections as applicable, for coordination of accessories and equipment requiring blocking in walls.

1.03 SUBMITTALS

A. Product Data: For each type of product specified.

B. Certificate: Furnish certificate evidencing that material meets or exceeds specification and fire rating requirement.

C. Samples: Textured panel**,** approximately 12" square, demonstrating texture finish.

D. Informational Submittals:
   1. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
      a. Evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.04 QUALITY ASSURANCE

A. Metal Support Standard: ASTM C754.

B. Metal Stud Standard: Fed Spec QQS-698 and QQS-775d, Class D.

C. Gypsum Board Standard: GA 216 by Gypsum Association.

D. Tolerances: 1/8" Offsets between planes of board faces and 1/4" in 8'-0" for plumb, level, warp and bow.

E. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
   1. Install mockups for the following applications:
      a. Surfaces indicated to receive textured paint finishes.
   2. Simulate finished lighting conditions for review of mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 PERFORMANCE / DESIGN CRITERIA

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate gypsum board, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by, and displaying a classification label from, an independent testing agency acceptable to the authority having jurisdiction.
   1. Construct assemblies to achieve fire resistance ratings indicated on Drawings, in accordance with applicable and referenced UL design numbers.
   2. In the event that requirements of assembly numbers referenced conflict with other Contract Document requirements, conform to assembly requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials with manufacturer's label attached. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging. Protect materials from dampness or wetting. Remove any damaged materials.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. 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. Gypsum Board and Related Products:
      a. G-P Gypsum Corp.
      b. National Gypsum Company.
      c. United States Gypsum Co. (USG)

B. Source Limitations:
   1. Provide wall board materials and accessories used on the project by one manufacturer throughout.

2.02 FRAMING MATERIALS AND ACCESSORIES

A. Gypsum Board Ceiling Cold Rolled Main Runner Carrying Channels: 1-1/2", 16 gauge steel channels with minimum 1/2" wide flanges.

B. Cold Rolled Furring Channels: 3/4", 16 gauge steel channels with minimum 1/2" wide flanges.

C. Hat Shape Furring Channels: ASTM C 645, 7/8" x 1-1/4", minimum 22 gauge, galvanized steel hat shaped sections.

D. Resilient Furring Channels: 1/2" deep steel sheet members designed to reduce sound transmission.
   1. Configuration: Hat shaped.

E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.03 GYPSUM WALLBOARD PANELS

A. General: Specifications based on materials and manufacturers listed are to set quality standard. Subject to compliance with requirements, provide the named products, or comparable products by another manufacturer.

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

C. Gypsum Wallboard: ASTM C 1396 unless otherwise indicated.
   1. Type X:
      a. Thickness: 1/2" and 5/8” As indicated.
      b. Long Edges: Tapered.
      c. Location: As indicated.
   2. Flexible Gypsum Board: Manufactured to bend to fit radii indicated and to be more flexible than standard regular-type gypsum board of same thickness.
      a. Thickness: 1/4", two layers.
      b. Long edges: Tapered.
   3. Moisture and Mold Resistant: With moisture and mold resistant core and paper surfaces, mold resistance ASTM D 3273, score of 10 as rated according to ASTM D 3274.
      a. Thickness: 5/8”.
      b. Long Edges: Tapered.
      c. Location: At restrooms, janitor rooms, sprinkler room, and similar wet and washable locations, except for backer board installed behind tile.

2.04 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325.
   1. Products: Subject to compliance with requirements, provide one of the following or other approved equal:
      a. Custom Building Products; Wonderboard.
      b. United States Gypsum Co.; DUROCK Cement Board.
   2. Thickness: As indicated.

2.05 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:

a. Cornerbeads: Equal to USG Dur-A-Bead. Use at outside corners.
b. Metal Edge Trim: Standard trim of galvanized steel with either knurled and perforated or expanded flanges and beaded for concealment of flange in joint compound. Equal to USG 200 or 400 Series. Apply where board abuts or terminates at another material.
    1) L-Bead: L-shaped; exposed long flange receives joint compound; use at exposed panel edges.
    2) J-Mold: Metal J-molds; exposed flange receives joint compound, use at all panel edges abutting dissimilar materials.
c. Gypsum Control Joints: Metal V-shape control joints. Use where indicated and at changes in backup material and in partitions at 30'-0" o.c. maximum, and at large gypsum board ceiling areas at 20'-0" o.c. maximum. Also provide at both sides all interior and exterior window & door frames.

B. Aluminum Trim: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy T-5. Extruded accessories of profiles and dimensions indicated in Drawings:
1. Profiles: As indicated in drawings.
2. Finish: Clear Anodized Aluminum.

2.06 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.
    a. Use polymer-coated (alkali-resistant) mesh tape, 2" wide at interior applications, and 3" wide at exterior applications.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound, equal to USG Durabond 90.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound, equal to USG Durabond Joint Taping Compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound, equal to USG Ready Mixed Joint Topping.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by panel manufacturer.

2.07 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Door frame Grout: Equal to USG Durabond 90 Joint Compound, Multi-Purpose.

D. Sealer Gaskets: 5-12" x 3/8" closed cell foam and adhesive backed peel and stick membrane, equal to Protecto Wrap (800-759-9727) "Triple Guard Energy Sill Sealer." Provide at all exterior metal studs in contact with floor slab.

E. Hanger Wire: ASTM A 641, 9 Gauge galvanized steel wire.

F. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

G. Insulation:
   1. Thermal Insulation: Refer to Division 07, Section "Thermal Insulation".
   2. Acoustical Insulation: Refer to Division 09, Section "Acoustical Insulation".
   3. Fire Resistant Assemblies: Provide mineral fiber insulation according to the requirements of the fire rated assembly, except where greater thickness is indicated for partitions that also carry an acoustical rating.

2.08 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
   1. Texture: Light Orange Peel.

PART 3 - EXECUTION

3.01 EXAMINATION AND COORDINATION

A. Examine areas and substrates including metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Interface and Coordination with Other Work:
   1. Coordinate installation of firestopping at penetrations through fire-resistive rated assemblies.
   2. Coordinate installation of joint sealers specified in Division 7 Section at penetrations of non fire-resistive rated assemblies.
   3. Coordinate support framing and blocking requirements of all construction to be attached to gypsum board assemblies.
   4. At partitions indicated to receive thermal or acoustical batts, pack insulation into cavities while framing is being fabricated for stud packs, box headers, and other framing cavities that will be inaccessible upon erection of framing.
   5. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
      a. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Main runner carrying channels attached to structure with hangar spacing as required to meet requirements of ASTM C 754, and other criteria as specified. Cross furring 3/4" channels attached to main runners.
   2. Deflection limited to 1/360 of span.
   3. Maximum allowable spacing of main runners, 48" O.C.; and cross furring 24" maximum O.C. At openings which interrupt main runners or furring channels, reinforce grille with 3/4" channels wire tied to and parallel to main runner channels.
   4. Maximum allowable spacing of hangers 48" O.C.
   5. Install uplift bracing to structure at exterior locations, vestibules, and at other spaces subject to wind uplift or sudden changes in air pressure.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   2. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards unless more stringent requirements are specified.
   4. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   6. Do not attach hangers to steel roof deck.
   7. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   8. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   9. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.03 INSTALLATION - PANEL ERECTION

A. General: Comply with ASTM C840.

B. Panel Installation:
   1. Use wallboard and sheathing of maximum lengths to minimize joints.
   2. Stagger end joints where they occur.

3. Stagger vertical joints on opposite sides of partitions, and stagger joints between each layer of panel in multiple layer installations, by at least one framing member.
    a. Exception: Do not bridge panels over expansion joints.
4. Locate end joints as far as possible from center of wall or ceiling.
5. Do not place butt ends against tapered or grooved edges. Do not place tapered edges against cut edges or ends.
6. Support ends and edges of wallboard on framing or furring members.
7. No wallboard installed over piping, ducts, electric boxes or conduits until they have been installed, run and tested.
8. Attach wallboard and sheathing with screws spaced 12" O.C. and staggered along abutting vertical edges.
9. Exterior grooved sheathing installed horizontally with tongue up.
10. Partitions indicated sealed to deck shall be continuous except where interrupted by structure, mechanical or electrical construction.
11. Fit gypsum panels around ducts, pipes, conduits, and structural members. Cut panels to fit profile of penetrations and apply a bead of sealant 1/4" to 3/8" wide.
12. Tape and float only is acceptable behind lockers that have solid backs unless otherwise required for partition fire or acoustical ratings.
13. Rated partitions shall have wall board continuous both sides above ceiling to deck and fire taped and sealed.
14. Partitions shown to include sound batt but not to extend to deck shall have wall board continuous to deck above ceiling and taped on one side only.
    a. Exception: Partitions shown to have acoustical insulation placed over ceiling to either side of the partition wall.
15. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, including floors and deck. Provide 1/4- to 1/2-inch wide spaces at these locations. Trim edges with edge trim where edges of panels will be exposed in the completed work. Seal joints between edges and abutting structural surfaces with acoustical sealant
16. Form control and expansion joints with space between edges of adjoining panels.

C. Curved Surfaces:
1. Install panels perpendicular to supports and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For multiple-layer construction, fasten base layer(s) to studs with screws 16 inches O.C. Stagger joints between successive layers. Fasten finish layer to studs with screws spaced 12 inches O.C.

D. Wall Tile Substrate: ANSI A108.11
1. Install tile backer board as substrate for thin set ceramic tile.
2. Space 1/4" above fixture lips.
3. Seal ends, cut edges and penetrations of each piece with water resistant compound before installation.
4. Tape & mortar over all joints prior to tile installation.

E. Accessory Installation:
1. Corner Beads: Install on external corners with suitable fasteners spaced 9" O.C.
2. Metal Trim: Install over face layer with fasteners spaced 9" O.C. where shown and where gypsum surfaces meet dissimilar materials.
3. Control Joint: Install control joints in locations where detailed, and the following, unless otherwise indicated:
    a. At changes in backup material.
    b. Vertically in partition walls at 30'-0" maximum on center.

c. Horizontally in partition walls taller than 16'. Confirm elevations of such joints with Architect.
d. In large ceilings 20'-0" maximum on center each way.

4. Aluminum Trim: Install in locations indicated in Drawings.

F. Joint Treatment Application:

1. Joint treatment compounds and products, as specified under Materials, shall be mixed and applied in accordance with manufacturer's direction to completely conceal all joints and screw depressions and provide a smooth surface to receive finishes as scheduled.

3.04 FINISH

A. Apply gypsum board finish in accordance with ASTM C 840, manufacturer's published instructions and GA-214 Finish Levels.

1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
   a. Application: In plenum areas above ceilings, in attics, in mechanical rooms, and in other areas where the assembly is generally concealed and not normally open to view. Accessories not required unless otherwise indicated or required by fire rated or acoustical rated construction.
      1) Where a fire resistance rating is required for the gypsum board assembly, details of construction shall be in accordance with reports of fire tests of assemblies that have met the fire rating requirement.
      2) Where acoustical rating requires more stringent finish application, comply with acoustical partition construction requirements.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges and sand joints. Provide level 2 finish where panels are substrate for plywood backer boards, and where specifically indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface, and sand smooth. Provide Level 4 finish typical, where panels are to receive painted finish unless specifically indicated otherwise.
   a. Texture for level 4 finish: Light orange peel texture, or other light texture as approved by Architect through sample and mockup review.
4. Prepared surfaces shall be coated with a primer/sealer prior to the application of finish paint. Refer to specification Division 9 Section for painting.
   a. Application: For use where gloss semi-gloss, enamel, eggshell, or non-textured flat paints are specified or where severe lighting conditions occur. Generally in all areas except where noted otherwise.

3.05 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup **and** free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and

overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.06 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.

3.07 PATCHING AND REPAIR

A. Remove and replace gypsum board panels that become wet, moisture damaged, or exhibit evidence of mold.

3.08 CLEANING

A. Contractor shall completely clean all areas affected by this work and shall leave no excess or scrap materials or bedding compound on the job site.

END OF SECTION 09 21 00

SECTION 09 22 26 - METAL SUSPENSION 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. Section Includes: Metal suspension support and framing components for interior and exterior gypsum wallboard, plaster and stucco ceilings and soffits.

B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections include the following:
   1. Division 7 Section “Exterior Insulation and Finish System.”
   2. Division 9 Section “Gypsum Wallboard.”
   3. Division 9 Section “Plaster.”
   4. Division 9 Section “Stucco.”
   5. Division 9 Section “Acoustical Ceiling Suspension Members.”

1.03 QUALITY ASSURANCE

A. Design Criteria:
   1. All suspended ceiling/soffit suspension systems installed so that deflection of finished surface does not exceed 1/360 of span.
   2. Exterior soffit supports and bracing designed and installed to withstand an I-90 uniform wind uplift loading condition.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers with brand or manufacturer's label attached. Protect metal materials from dampness or wetting. Store metallic materials and accessories indoors off floor.

PART 2 - PRODUCT

2.01 PRODUCTS

A. Carrying Channels: 1-1/2 inch 16 ga. galvanized steel channels with minimum weight of 475 lbs. per 1,000 lineal feet.

B. Furring Channels: 3/4 inch 16 ga. galvanized steel cold-rolled channels with minimum weight of 300 lbs. per 1,000 lineal feet.

C. Hat Channels at Gypsum Board Ceilings: 7/8 inch 25 ga. galvanized roll formed furring channels.

D. Tie Wire: 16 Ga. galvanized steel wire for tying channel iron to framing members.

E. Hangers: 8 Ga. galvanized annealed steel wire.

F. Metal accessories for EIFS or Stucco Soffits: 26 ga. galvanized as made by USG, Milcor or Fry.
   1. Corner Bead: USG No. 1A
   2. Bead: USG No. 66, 7/8".
   3. Control Joint: USG No. 75, USG No. 100
   4. Metal Trim: USG No. 200-A

G. Furring Channels: 7/8" Roll-formed hat-shaped section of minimum 25 gauge galvanized steel for use at gypsum panel ceiling.

H. Fasteners: 1" Type S screws.

I. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armstrong World Industries, Inc.; Drywall Grid Systems.
      b. Chicago Metallic Corporation; Drywall Grid System.
      c. USG Corporation; Drywall Suspension System.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Wire-tying:
   1. Splicing: Double wrap tie.
   2. Horizontal stiffeners to channel brackets: Figure eight tie.
   3. Framing members perpendicular to each other: Saddle tie.

B. Workmanship: Work erected in perfect condition, level plumb, true and rigid with all requisite bracing and stiffening members provided as required.

3.02 FURRING & SUSPENDED CEILINGS & SOFFITS

A. Attach hangers to structure at maximum 48" o.c. in direction of carrying channels and 36" o.c. in direction of cross furring and in accordance with manufacturer's instructions. Hanger design and spacing as required to meet design criteria. Hangers also installed within 6" of perimeter walls and ends of main runner channels.

B. Maximum allowable spacing of main runners, 48" O.C.; cross furring 12" O.C..

C. Furring securely wire tied and of ample strength to support required load without deflections exceeding design criteria. Do not continue furring continuous across control or expansion joints. Position and level carrying channel and saddle-tie securely with hanger wire.

D. Position 3/4" cross furring across carrying channels and saddle tie to carrying channels with three strands of 18 ga. tie wire.

E. Install vertical bracing as required for wind uplift loading, per I-90 requirements, or maximum 4'-0" o.c.e.w. Vertical bracing shall be 3-5/8" 18 gauge steel studs.

3.03 METAL ACCESSORIES

A. All openings, edges or where gypsum board edges terminate against dissimilar materials provide metal edges. Cornerites used at all junctions, corners, etc., unless otherwise noted. All exposed vertical and horizontal corners protected with corner beads.

3.04 GRID SUSPENSION SYSTEMS

A. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

END OF SECTION 09 22 26

SECTION 09 24 10 - STUCCO PLASTER

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. Section Includes:
   1. Provide cement stucco as shown on the Drawings and as specified herein.

B. Related Sections include the following:
   1. Division 04, Section "Manufactured Stone".
   2. Division 06, Section "Wood Framing" for exterior wall support framing.
   3. Division 06, Section "Sheathing", for plywood backing / sheathing behind stucco.
   4. Division 07 Section "Air Barriers", for weather resistive barriers installed behind stucco.
   5. Division 07 Section "Sheet Metal Flashing and Trim".
   6. Division 09, Section "Painting".

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis application instructions, for each material proposed for use.

B. Samples: Submit samples for each factory-prepared finish coat and for each color and texture specified.

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Install plaster to meet requirements of local building code.

B. Mock-up: Prior to beginning work, Architect will furnish color schedule for surfaces to receive stucco. Use specified color and texture when preparing mock-ups for review. Provide 8'-0" x 8'-0" mock up wall at job site for Architect's review of color and texture.

1.05 COORDINATION

A. Consult other trades in advance and make provisions for their work to avoid cutting and patching.

1.06 DELIVERY AND STORAGE

A. Deliver manufactured materials in original packages and containers, bearing name of manufacturer and brand. Store plaster, cement, and lime off ground under watertight cover, and away from damp surfaces. Remove damaged or deteriorated materials from premises.

1.07 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.

2. Apply plaster when ambient temperature is greater than 40 deg F.
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

E. Adjacent surfaces of building shall be protected from splatting or other staining caused by plastering by use of suitable drop cloths and masking.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lath: Exterior lath shall be ASTM A 653, G60 hot dip galvanized.
1. At Ceiling and Soffits: 2.75 lb./yd. galvanized steel 1/8" flat rib lath. Lath Backing: 15# asphalt saturated felt, non-perforated, unless otherwise noted in Drawings.
2. Lath at Interior Walls: 1.75 lb./yd. painted diamond lath, self-furred and non-backed.

B. Bonding Agent: ASTM C 932, ACRYL - 60 as manufactured by THORO Corp, or equal.

C. Factory Blend of Portland Cement, Sand, and Chemical Admixtures: Equal to AMX 710 WMMR Preblended Water, Mold and Mildew Resistant Stucco by Amerimix.

D. Water: Clean, fresh, potable.

E. Wire: ASTM A 641, Class 1 zinc coating, soft temper, not less than 0.0475 inch diameter unless otherwise indicated.

F. Finish Materials:
1. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems formulated with colorfast mineral pigments and fine aggregates; for use over cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes. Color(s) as indicated on drawings.

2.02 ACCESSORIES

A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required. Metal accessories fabricated from hot-dip galvanized steel sheet ASTM A653, G60 zinc coating unless otherwise indicated.

B. Vertical Control Joints: Zinc alloy control joint equal to Cemco Double-"V" Control Joint (#15), or approved equal.

C. Horizontal Control Joints: Equal to #15 Solid Leg Control Joint by Cemco.

D. Corner Bead: Equal to 1-A Expanded Corner Bead by Cemco.

E. Casing Bead: Provide zinc alloy casing head at all plaster terminations equal to #66 expanded flange casing bead by Cemco.

F. Soffit Drip Edge: Equal to #12 Soffit Drip Edge by Cemco.

G. Wall Base Weep Screed: Equal to J-Series Casing Bead by Cemco.

H. Other Accessories: Provide furring brackets, fasteners, cornerites, reinforcements, etc. for complete installation / fabrication of galvanized steel.

2.03 MIXING AND PROPORTIONING

A. General: Mechanically mix plaster in accordance with manufacturer's directions and ANSI A42.2-1971. Do not re-temper or use material that has partially set. Do not use frozen, caked, or lumpy materials. Clean mixer of mixing boxes of set or hardened materials before materials for a new batch are loaded. Mix each batch separately. Thoroughly dry mix materials before adding water.

2.04 FINISH

A. Finish texture shall be medium sand, uniform, consistent and non-directional.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Verify that surfaces to be plastered are free of dust, loose particles, oil and other foreign matter which affect bond of plaster coats.

B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.02 PLASTER LATH AND ACCESSORY INSTALLATION

A. General: Install according to ASTM C 1063, and in specific locations as indicated in Drawings.

B. Locate control joints as approved by Architect for visual effect and to delineate panels as follows:
   1. Vertical surfaces: 144 Sq. Ft.
   2. Horizontal and other non-vertical surfaces: 100 Sq. Ft.
   3. At distance between parallel joints not greater than 18 feet.
   4. As required for panels with length to width ratios not greater than 2-1/2:1
   5. Where control joints occur in substrate construction directly behind stucco.
   6. Where plaster areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
   7. Joint locations indicated in Drawings generally indicate locations where certain joint lines are desired but are not necessarily complete for all joints required.

C. Anchor accessories to plaster base or substrate at 8" o.c. along each flange by tying to lath.

D. Miter exposed corners and install with tight joints.

E. Locate and space control joints at 12'-0" o.c.e.w., unless shown otherwise on drawings.

F. Set accessories plumb and level with a tolerance of 1/8" in 10'-0". Connect lengths of accessories to assure a continuous line without gaps or ridges.

G. Metal lath installed with long dimension perpendicular to supports, mesh lapped 1/2" at sides and 1" at ends. Lap ends over supports. Secure lath to supports at 6" o.c.. Do not continue lath across control or expansion joints.

H. Apply lath backing to exterior sheathing, except at areas of polystyrene insulation sheathing.

I. All openings, plaster edges or where plaster edges terminate against dissimilar materials, provide plaster screeds. Use vented screed at perimeter of soffit areas.

J. Cornerites used at all junctions, corners, etc., unless otherwise noted. All exposed vertical and horizontal plaster corners protected with corner beads.

3.03 PLASTER APPLICATION

A. General Requirements: Comply with ASTM C 926.
   1. Apply in three-coat work to a minimum thickness of 3/4" - 7/8".
   2. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
   3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

B. Stucco on Metal Lath: Apply Portland cement plaster (stucco) in a three-coat application over metal lath with thickness not less than 3/4" in locations as indicated on drawings. Scratch, brown and finish coat shall be applied as follows:
   1. First (Scratch) Coat: Shall be applied to metal reinforcement with sufficient material and pressure so that it is shoved through the metal reinforcement to completely embed the reinforcement.
      a. Thickness of scratch coat shall be approximately 3/8". Before scratch coat has hardened, it shall be evenly scratched with a standard scratcher to provide good mechanical key for the second or brown coat.
      b. Scratch coat shall be continuously moist cured for not less than 48 hours after application.
   2. Second (Brown) Coat: Shall be applied not sooner than 48 hours after application of scratch coat. Before applying the brown coat, the surfaces of scratch coat shall be dampened evenly to obtain uniform suction.
      a. Thickness of brown coat shall be a minimum of 3/8" total thickness and shall be applied in two applications or coats, one immediately following the other.
      b. Surface shall be brought to a true, even surface by floating or rodding and left rough, ready to receive finish coat.
      c. Brown coat shall be continuously moist for 48 hours after application and then allowed to dry.
   3. Finish coat of cement plaster work shall be laid out to permit completion of an entire surface in one operation. If this is impracticable, the plastering shall be carried to some natural breaking point as approved by the Architect.
      a. Finish coat shall be applied not sooner than 7 days after the application of preceding coat. Before applying finish coat, the surface of preceding coat shall be dampened evenly to obtain uniform suction.
      b. Finish coat shall be 1/8" thick minimum machine applied to prepared base coats. Finish shall be applied in strict accordance with manufacturer's directions to achieve finish specified.
   4. Apply two coats of water repellent sealer.

C. Machine applied finishes on metal lath as per Finish Coat Specification shall be uniform in texture, color and overall appearance.

D. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

3.04 PATCHING

A. Patch defects in workmanship and materials. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed. Patches in finished areas shall match adjacent surfaces.

3.05 CLEANING

A. Remove plaster and protective materials from expansion beads and metal accessories. Remove plaster splatters and debris from other surfaces. Remove rubbish, debris, and scaffolds from spaces and leave broom clean.

END OF SECTION 09 24 10

SECTION 09 30 13 - CERAMIC TILING

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 the following:
   1. Ceramic tile.
   2. Stone thresholds installed as part of tile installations.
   3. Crack suppression membrane for thin-set and medium set tile installations.
   4. Waterproof membrane for thick-set tile installations.
   5. Cementitious backer units installed as part of tile installations.

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete".
   2. Division 07 Section "Joint Sealants" for additional quality standards for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   3. Division 08 Section "Access Doors and Panels" for coordination with access doors and panels installation.
   4. Division 09 Section "Gypsum Board Assemblies" for cementitious backer units.
   5. Division 09 Section "Flooring" Sections for transition strips other than those specified in this Section.
   6. Division 10 Section "Toilet Accessories", and other sections as applicable, for coordination of recessed items installed in tiled walls.
   7. Division 22, for coordination with plumbing fixtures, floor drains.

1.03 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.04 REFERENCE STANDARDS

A. TCA / TCNA: Tile Council of North America, Inc., and the TCNA Handbook for ceramic, glass, and stone tile installations, most current versions.

B. ANSI A108.01, Requirements for movement joints.

C. Marble Institute of America (MIA): Dimension Stone Design Manual for Expansion Joints.

D. ASTM C1242, Standard guide for selection, design, and installation of dimension stone attachment systems.

E. ASTM C1193, Standard guide for the use of joint sealants.

F. ASTM C1472, Standard guide for calculating movement and other effects when establishing sealant joint width.

1.05 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as tested per the DCOF AcuTest (ANSI A137.1):
   1. Level Surfaces: Minimum 0.42.

B. All sealants used in floor or traffic applications shall have a Shore A hardness not less than 35.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
   3. Full-size units of each type of trim and accessory for each color and finish required.
   4. Stone thresholds in 6-inch lengths.

1.07 INFORMATIONAL SUBMITTALS

A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

B. Product Certificates: For each type of product, signed by product manufacturer stating products are suitable for intended application.

C. Qualification Data: For Installer.

D. Material Test Reports: For each tile-setting and -grouting product and special-purpose tile.

E. Letter from sealant manufacturer, stating suitability of products for each application indicated.

1.08 QUALITY ASSURANCE

A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and who are CTI, CTEF, ACT, or TCNA 5-Star TCCA Trowel of Excellence certified.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:
   1. Grout and mortar setting shall comply with, ANSI A108.4 and ANSI A 108.5.
   2. Manufacture all ceramic tile in accordance with Standard Grade Requirements of ANSI 137.1.
   3. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic Tile Installation of the Tile Council of North America, Inc., latest edition.

C. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
   1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.

F. Mockups: Build mockups to demonstrate aesthetic effects.
1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. View mockup under permanent lighting conditions.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 WARRANTY

A. Provide 10-year labor and material Warranty.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.12 MAINTENANCE MATERIALS

A. Furnish extra materials that are from same production runs as products installed, that match products installed, and that are packaged with protective covering for storage and identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following requirements apply for product selection:
1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or an approved comparable product by another manufacturer.

2.02 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the specified product:

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Warpage: No more than one-tenth the length of the measured span of the tile can exhibit more than 25 percent of total allowable warpage.

2.03 TILE PRODUCTS

A. Available Suppliers whose products may be incorporated into the work include but are not limited to the following:
   1. As scheduled for new tile.

B. Floor Tile: Porcelain tile. Size and type as indicated on drawings.

C. Trim & Special Tile: Provide necessary caps, stops, coves, returns, trimmers, and other shapes as required for a complete installation. Items to be supplied by the same manufacturer supplying the tile.

D. Bullnose Base: Porcelain tile. Base to match tile color to be selected for the floor. Size and type as indicated on the drawings.

2.04 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Stone Thresholds: ASTM C 615 with honed finish.
   1. Stone or Marble: In thicknesses as required for installation indicated in part 3 and as detailed in Drawings. Uniform, fine to medium-grained stone or marble in color as selected by Architect from manufacturer’s full range. Bevel edges at 1:2 slope. Align lower edge of bevels with adjacent floor finishes.
      a. Where a stone threshold is indicated for 3'x5' handicap accessible showers, provide threshold without any bevel and sized for flush installation.

2.05 WATERPROOFING MEMBRANES FOR THICK-SET TILE INSTALLATIONS

A. Basis of Design Products: Design is based on products indicated. Subject to compliance with requirements; provide one of the named products, or an approved equal substitution.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.
   1. Waterproofing Membrane: ANSI A118.10:

a. LATICRETE International, Inc.; Laticrete 9235 Waterproof Membrane.
b. Custom Building Products; Custom 9240.
c. MAPEI; Mapelastic 400 Waterproof Membrane.

2.06 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following;

B. Waterproofing Membrane (Concrete Slabs).
1. Flexible load-bearing, self-curing liquid rubber polymer and reinforcing fabric to form a seamless, heavy-duty waterproof membrane below a protective surface. Provide continuously under floor tile and behind wall tile:
a. Laticrete; "9235".
b. MAPEI; Mapelastic 400.
c. Custom Building Products; Custom 9240
2. Provide reinforcing membranes at floor to vertical surfaces, and for other conditions as recommended by Manufacturer for the waterproofing system indicated.

2.07 SETTING MATERIALS

A. Setting Materials Quality, General: Standards and materials specified herein are to set a minimum acceptable quality standard for setting materials. Contractor may, at Contractor's option and without change in price, propose to provide a higher grade of setting materials that may in Contractor's opinion reduce labor costs, reduce setting time, or afford other benefits in installation. Include for Architect's consideration the reasons for any such proposed revisions of setting materials with product submittal.

B. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.

C. Portland Cement Thickset Mortar Installation Materials: ANSI A108.02.
1. Thickset Bed Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.

D. Latex-Polymer Modified Portland Cement Mortar (Thin Set) for Wall and Floor: ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site. Available products include the following:
a. MAPEI; Ultraflex 2.
b. Custom Building Products; VersaBond Flex.
c. Laticrete; 253 Gold.

2.08 GROUT MATERIALS:

A. Ready-to-Use, Non-Staining Grout: Pre-Mixed Non-Staining Professional-grade, ready-to-use color consistent quartz aggregate grout, for use with grout joints 1/16" to 1 /2" (1,5 to 12 mm) and complying with ANSI A118.6, ANSI A118.7, and ISO 13007; CG2.
1. Available Products:
a. MAPEI; Flexcolor CQ.
b. Custom Building Products; Fusion Pro.

2.09 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
   1. Where Grout Manufacturer's sealants meet requirements throughout, use Grout Manufacturer's matching color sealants for sealant joints between tiles. Available Products:
      a. MAPEI; Mapesil.
      b. Laticrete; Latasil.
      c. Custom Building Products; Commerical 100% Silicone Caulk.
   2. Other Available Products may include:
      a. Dow Corning Corporation; Dow Corning 786.
      b. GE Silicones; Sanitary 1700.
      c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
      d. Tremco, Inc.; Tremsil 600 White.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
   1. Available Products:
      a. MAPEI; Mapeflex P1 SL.
      b. Bostik; Chem-Calk 550.
      c. Mameco International, Inc.; Vulkem 245.
      d. Pecora Corporation; NR-200 Urexpan.
      e. Tremco, Inc.; THC-900.

E. Joint Backers: Foam joint backer material to prevent sealant bond and form recommended joint cross sectional shape. Round or rectangular with rounded top, and in sizes as appropriate to joint sizes and conditions.

2.10 CEMENTITIOUS BACKER UNITS

A. Provide 5/8” cementitious backer units at all walls to receive tile and on top of plywood subfloor/deck to receive waterproofing and tile All walls in wet areas complying with ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints re: Division 09 Section “Gypsum Board Assemblies.”

2.11 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.12 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Contractor shall apply leveling coat or dry-set mortar over wall and floor surfaces which may vary more than 1-inch in 10 feet. Installation constitutes acceptance of the substrate.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors, installed with adhesives or thin-set mortar that complies with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
   1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
   2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
   1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.
      b. Tile floors composed of tiles 8 by 8 inches or larger.

B. TCNA Installation Guidelines: TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: As indicated on drawings. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints per approved shop drawings, and in compliance with TCNA handbook recommendations where indicated during installation of settings materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Do not allow grout, setting materials, or other hard materials to restrict movement or bridge across at movement joints.
   1. Install sealant materials per manufacturer's installation instructions and industry standards. Clean and prime surfaces as recommended by manufacturer. Do not exceed temperature limitations, including where required shading of joints until after cured where joints are exposed to direct sunlight.
   2. Locate joints at inside corners, in tile surfaces directly above joints in concrete substrates, and per reference standards.
   3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
   4. Install movement joints with appropriate joint backer material.
   5. Install movement joints per details in TCNA EJ171, except where pre-fabricated joint profiles are indicated.
   6. Sealant profile shall be slightly concave.

G. Grout tile to comply with requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
   2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

H. Where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.04 ANTI-FRACTURE AND WATERPROOFING MEMBRANES INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer’s written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Install water proofing membrane under and behind floor tile and turned up vertical behind cove base in all restrooms.

C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.05 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCNA installation methods and ANSI A108 Series of tile installation standards.
   1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
      a. Tile floors composed of tiles 8 by 8 inches or larger.

B. Joint Widths: Install tile on floors with the following joint widths:
   1. Ceramic Tile: 1/8 inch.
   2. Unless otherwise approved by Architect, accurately cut tile to install with joint widths between tile and floor drains, floor sinks, and similar items in floors, to the same joint widths as in the tile field.

C. Tile Pattern: As indicated in Drawings.

D. Stone Thresholds: Install stone thresholds at restroom entries and where called for in Drawings; set in same type of setting bed as abutting field tile, unless otherwise indicated.
   1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
   2. Install thresholds in compliance with Texas Accessibility Standards or local handicap accessibility code having jurisdiction.
      a. At doorways or transitions to adjacent flooring, install threshold with 1:2 beveled edges, set with top of threshold 1/8" to 1/4" above adjacent tile floor and not more than 1/2" total height above lowest adjacent flooring. Bottom of beveled edges should be flush to 1/16" above adjacent flooring surfaces unless otherwise detailed in Drawings.
      b. Where a stone threshold is indicated for 3'x3' handicap accessible showers, install threshold with 1:2 beveled edges, set between 3/8" to 1/2" vertical height above the lowest adjacent flooring.
      c. Where a stone threshold is indicated for 3'x5' handicap accessible showers, install non-beveled threshold flush with the shower floor tile or pan. Float the floor up between 1% min. to 2% max. as required to provide slope back to the shower drain. There shall be no curb at the flush transition.

3.06 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09 30 13

SECTION 09 51 00 - ACOUSTICAL CEILINGS

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. Section Includes:
   1. Provide acoustical ceilings as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 09 Section - Non-Structural Metal Framing.
   2. Division 09 Section - Metal Support Systems, for gypsum board ceilings support system.
   3. Division 21 through 28 Mechanical and Electrical Sections, for coordination with devices installed in grid ceilings.

1.03 QUALITY ASSURANCE

A. Fire Hazard Classification: Maximum flame spread, Class A (less than 25) as tested in accordance with ASTM E-84 and per Fed. Spec. SS-S-118a.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.

B. Samples: Set of 4" x 4" square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.

1.05 COORDINATION

A. Contractor shall coordinate connection of lighting and electrical devices to grid. Where lighting fixtures are provided with integral clips, install lighting fixture with the clip attachments and not with screws through grid tees.

PART 2 - PRODUCTS

2.01 CEILING TILE AND GRID

A. Acoustical Panels:
   1. Type AC1: 24" x 24" x 5/8" mineral fiber tile made for a lay-in grid suspension system. Panel design is Armstrong "Dune", Color: White. Edge: Angled Tegular

B. Lay-in suspension system: Exposed steel members made for use with panel types specified. System supplied with all main runner tees, cross tees, wall angles, clips, connectors, fastening and hangar wires.
   1. Grid to be 24" x 24" pattern with white finish. Armstrong’s “Prelude ML” 15/16” exposed tee, or approved equal.

2.02 MISCELLANEOUS MATERIALS

A. Edge Treatment for cut edges of tegular and grooved edge ceiling tiles and planks: Manufacturer's recommended touch up paint.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ceiling grids and acoustical panels completely installed in all areas indicated. Ceiling plenum shall be completely enclosed from adjoining conditioned space by structure, partitions, and/or acoustical panels.

B. Suspension systems installed by direct suspension from structural systems in accordance with manufacturer's specification. Hanger wire shall support no greater than 16 square feet. Install additional hangars at ends of each suspension member, at each end of light fixtures, and 6 inches from vertical surfaces. Do not splay wires more than 5 inches in a 4 foot drop. Bottom of surfaces shall be flush and level. Miter corners where wall moldings intersect.

C. The plumbing and heating contractors shall not utilize hangers or framing of suspension system. The electrical contractor may utilize suspension system for lay-in fixture installation but shall furnish two supplementary hangers per fixture for maintaining maximum load deflection. Electrical contractor shall not utilize tile as sole support for any ceiling-mounted electrical device. All ceiling-mounted electrical devices shall be supported with brackets attached to tees.

D. Ceilings laid out as shown on the drawings, however, if not specifically shown, ceilings laid out from center of room in both directions so that cut tiles are equal at all edges. Place materials to have full bearing on suspension members.

E. Where there are cut edges that will be visible in the finished work at tegular tile, or other tile with profile below the grid, touch up cut edges as recommened by Manufacturer with Manufacturer's recommended touch-up paint. Do not apply touch-up paint on the face of ceiling tile.

3.02 INSPECTION

A. Following installation, soiled or discolored units cleaned to match adjacent perfect material. Any broken or damaged material which cannot be corrected by cleaning, removed and replaced with perfect material.

END OF SECTION 09 51 00

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide all resilient flooring materials with accessories as shown on the drawings and as herein specified.
   2. All areas of new construction and all renovated areas shall receive vinyl composition tile flooring and new base per these specifications, unless scheduled or noted otherwise.

B. Related Sections include the following:
   1. Division 9 Section “Carpet.”

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials delivered to job site in manufacturer's unopened containers with labels intact. Store materials at minimum temperature of 70°F in all areas for at least 48 hours prior to installation.

1.04 JOB CONDITIONS

A. Environmental Requirements: Maintain temperature of 70°F in all areas for at least 48 hours before, during and after installation. Maintain a temperature of 60°F after installation.

1.05 SUBMITTALS

A. Submit the following samples of each type, color, and pattern of resilient flooring and accessories required, showing full range of color and pattern variations.
   1. Full size tile samples
   2. 2' long samples of resilient flooring accessories.

1.06 QUALITY ASSURANCE

A. Tile, Mastic and all other materials shall be asbestos free.

B. Install resilient floor tiles in accordance with the recommended method of the "Tile Contractors Association of America Handbook".

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.07 EXTRA MATERIALS

A. Provide the following, for each color and type installed, for future replacement:
   1. Floor Tile: 10% of installed quantity.
   2. Rubber Base: 10% of installed quantity.
   3. Stair Treads: 10% of installed quantity.
   4. Vinyl Transition Mouldings: 10% of installed quantity.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Luxury Vinyl Tile: 1/8" (3.0mm) thin planks giving the authentic appearance of timbers. 20 mil wear layer and 15 year commercial warranty. Material shall be from manufacturer Karndean's Luxury Vinyl Plank style: "Van Gogh" in 48" x 7" planks of "VGW94T Honey Oak".

B. Luxury Vinyl Tile: 1/8" (3.0mm) thin planks giving the authentic appearance of timbers. 20 mil wear layer and 15 year commercial warranty. Material shall be from manufacturer Karndean's Luxury Vinyl Plank style: "Van Gogh" in 48" x 7" planks of "VGW91T Tawny Oak".

C. Luxury Vinyl Tile: 1/8" (3.0mm) thin planks giving the authentic appearance of timbers. 20 mil wear layer and 15 year commercial warranty. Material shall be from manufacturer Karndean's Luxury Vinyl Plank style: "Opus" in 24" x 18" tiles of "SP212 Terra".

D. Luxury Vinyl Tile: 1/8" (3.0mm) thin planks giving the authentic appearance of timbers. 20 mil wear layer and 15 year commercial warranty. Material shall be from manufacturer Karndean's Luxury Vinyl Plank style: "Van Gogh" in 48" x 7" planks of "VGW94T Honey Oak".

E. Luxury Vinyl Tile Design Strips: 3mm wide and 2.5mm thick strips giving the look of grout lines to be placed between Opus Stone-Look tiles as referenced in specs and drawings. 20 mil wear layer and 15 year commercial warranty. Material shall be from manufacturer Karndean's Luxury Vinyl Design Strips: in strips of "AF04"

F. Vinyl Reducer Strips: Tile reducer strips, 1 inch x 1/8 inch tapering to 1/16 inch. Strips equivalent to Flexco Vinyl Floor Accessories as made by Flexco, Division of Textile Rubber Company. Strip shall match color of rubber base.

G. Transitional Moulding: 1-1/2" Resilient/Ceramic "T" edge strip and track; "Cerco T" No. 360 and track No. 970 as manufactured by Mercer Products Co. or approved equal.

H. Rubber Base: Base 4" high x 1/8" thick complying with FS SS-W-40a, Type I equal to that manufactured by Johnsonite, Armstrong, Flexco or approved equal. Cove base at vinyl flooring and straight base at carpeting. Color as indicated on drawings.

I. Rubber Stair Stringer: 10" high, cut to fit profile of stair treads. Manufactured by Johnsonite, Armstrong, Flexco or approved equal.

J. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer. Concrete areas to receive sheet vinyl shall not have sealer or hardener applied.

K. Adhesive: Waterproof, stabilized type as recommended by material manufacturer for each specific product and for its area of use. Leveling material as specifically recommended by material manufacturer.

L. Leveling Compound: Latex type as specifically recommended by material manufacturer.

M. All materials best grade, with no second grade, off goods or remnants allowed.

PART 3 - EXECUTION

3.01 INSPECTION

A. All surfaces receiving resilient flooring material shall be examined by the installer for any defects which in his opinion, he considers detrimental to a proper installation. Concrete floors dry and free of dust and laitance. Any defects found during inspection must be corrected prior to installation; this includes any sanding, brushing or leveling required. Installation constitutes acceptance of substrate conditions.

3.02 INSTALLATION

A. Clean all surfaces of grease, dirt, paint and other objectionable matter. Fill and level any holes, cracks, joints and depressions in substrate with leveling material. Provide backer material if necessary.

B. Flooring and accessories installed in strict accordance with manufacturers printed instructions.

C. All vinyl tile to be laid in patterns as indicated on drawings. Unless noted otherwise, floor tile shall be laid so that fields or patterns center on area to be tiled. No tiles will be less than half size.

D. Lay tiles with close joints, fit neatly into recesses and around abutting work. Tile cemented securely and solidly in place. Finished surfaces true in plane and flush throughout.

E. At places where flooring terminates, provide vinyl reducing edge strips.

F. At transitions between floor types provide appropriate molding accessory. Mouldings at corners shall be mitered.

G. Apply wall base to walls, casework/cabinets and other permanent fixtures in rooms or areas where base is required. In areas using vinyl / sheet flooring material 4" up the wall, supported by a 7/8" cove stick, adhere to wall using manufacturer's recommended adhesive, and cap the integral cove with approved cap strip. Tightly bond continuous base to substrate with contact at horizontal and vertical surfaces.

H. At places where flooring abuts a vertical surface without cove base or at floor transitions tile shall be cut evenly and without a gap between the tile and adjacent surface.

I. Trim stair stringers to appropriate length and width. Install using manufacturer's recommended adhesive.

3.03 PROTECTION AND CLEANING

A. Protect floors with un-dyed, untreated Kraft paper immediately after placement. Traffic should be kept off for at least 8 hours. No heavy equipment or scaffolding should be dragged over the floor.

END OF SECTION 09 65 00

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Perform all work required to complete the Carpeting indicated by the Contract Documents and all work that can be reasonably inferred to be included. Furnish all supplementary items necessary for its proper installation.

B. Related Sections include the following:
   1. Division 09 Section “Resilient Base and Accessories”, for rubber base.
   2. Division 09, floor finish Sections, for transition with adjacent flooring systems not covered in this Section.

1.03 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's complete technical product data for each type of carpet, cushion and accessory item required. Indicate installation pattern and other options.

B. Samples:
   1. Four full-size carpet tiles of each pattern and color tile specified, exhibiting full color range of the carpet.
   2. 12" long sample of each accessory item.

C. Maintenance Instructions:
   1. Carpet manufacturer shall give a written maintenance outline to the Owner for proper care of the installed material. This shall include type of cleaning apparatus to use, type of cleaning agent required and material supplier's address and phone.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver all materials to the project properly protected taking care not to damage any materials.

1.05 JOB CONDITIONS

A. Environmental Requirements: Temperature of rooms in which carpeting is to be installed shall be properly maintained at adhesive manufacturer's recommended levels.

B. Field Measurements: All dimensions are approximate and the Contractor shall be responsible for verifying all dimensions and conditions in the field prior to installation.

1.06 CONTRACTOR QUALIFICATIONS

A. The Contractor shall be experienced in the supervision of carpet installation, with at least five (5) years experience in this type of work. The actual work shall be done by qualified

and experienced mechanics working under his supervision or under the supervision of an experienced workroom supervisor who has also been doing this type of work for five years.

1.07 WARRANTY

A. Manufacturer's standard form, limited lifetime commercial warranty.

1.08 EXTRA MATERIALS

A. Provide 10% of installed quantity as attic stock for future replacement, of each color and pattern indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The following products/manufacturers are acceptable:

As scheduled in the Drawings.

2.02 MATERIAL

A. Carpet: Provide material of construction, material, weight, and aesthetic and other properties and performance factors equal to or exceeding scheduled products, as approved by Architect, and as follows:
   1. Static control below 3.5 K.V.
   2. Class I.
   3. Flammability meeting NFPA-253 and ASTM-E648 (.45 watts/cm2).
   4. Smoke density meeting NFPA-258 - 450 or less.
   5. Color and Pattern: As indicated on Drawings.
   6. Tile Size: 24" x 24"

B. Adhesive: Waterproof type recommended in writing by carpet manufacturer to suit this application and expected service.

C. Edge Strips: Rubber butting gauge shall be Mercer's #EG-XX-B in color to match base, or approved equal.

D. Carpet Reducer: Rubber reducer #CRS-XX of height equal to carpeting, and other accessories as made by Mercer, or approved equal. Colors as selected by the Architect from manufacturer's full range of colors.

E. Carpet Tile Adapter: Rubber tile adapter equal to Mercer's #CTA-XX-A of color as selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. The carpet manufacturer's recommended procedures for installation shall be closely followed. Particular attention is to be paid to recommendations for application of floor covering adhesive, and seams.

B. Carpet edgings shall be neatly trimmed for tight fit along walls, cut and fit evenly around all projections and into trim strips. Fit closely and evenly to, in and through doorways, terminating carpet under doors. Finished installation shall be smooth and free of ripples and puckers.

C. Carpet binder bar shall be supplied and installed as required at doorways and other openings adjoining hard surface materials. Secure with nails appropriate for substrate.

D. All carpet shall be laid in quarter turn pattern, unless specifically shown otherwise.

E. Spots and smears of floor covering adhesive and seam cement shall be removed immediately.

F. Perform initial vacuum cleaning of entire installation and leave in clean condition.

3.02 INSPECTION AND PREPARATION

A. Contractor shall inspect substrate before starting his work. Any objectionable conditions shall be brought to the attention of the Contractor. Any high ridges, excessive gaps or other items must be repaired prior to installation. Contractor shall apply leveling material over uneven or rough surfaces.

B. Do not proceed with work until defects are corrected. The Contractor shall check all dimensions and other conditions in area of work, and shall be responsible for proper fitting of carpet in areas designated.

C. Before installation, remove debris and job soiling with a vacuum and damp mop.

D. The application or installation of carpet by the contractor constitutes acceptance of substrate.

3.03 FLOOR INSTALLATION

A. Install carpet using direct glue method in accordance with carpet manufacturer's recommendations.

B. Carpet shall be installed in largest possible pieces. Center carpet layout for equal size pieces at edges.

C. Check carpet before beginning installation and ensure there are no visible variations between dye lots.

D. Cut and fit neatly around projections through floor and to walls or other vertical surface, leaving no gaps. Hardware items mounted to the substrate shall be removed and reinstalled following carpet installation.

E. All edges shall be free from fraying. On all finished edges where carpet abuts an adjacent floor at the same or different level, finishing strips must be applied as specified. Finishing edges shall be mechanically fastened to substrate.

F. Metal edge moldings shall be mitered at corners and mechanically fastened to substrate at 12" O.C. minimum. Do not fasten through carpet. Tap downs shall be installed without denting.

G. Carpet installation shall be unwrinkled, without twist, laid tight and flat to subfloor, well adhered, and present a uniform appearance. Ensure color, pattern and texture match within any one area.

H. Carpet step-off saddle and reducer strips shall be supplied and installed at doorways, where carpeting abuts dissimilar floor surfaces.

I. Do not place heavy objects such as furniture on carpeted surfaces for minimum of 24 hours or until adhesive has set.

J. Carpet which wrinkles or loosens at tile edges within one year from date of installation shall be corrected at no cost to the Owner.

3.04 CLEAN-UP

A. After carpet installation is complete, remove all remnants, wrapping paper and debris. Neatly trim all sprouting tufts with sharp scissors. The Owner shall view all carpet scraps

and retain any as designated for future repairs, before they are removed from the job site. These scraps shall be in addition to attic stock or maintenance material specified.

B. All carpet shall be vacuumed and left protected in a manner ready for occupancy.

END OF SECTION 09 68 13

SECTION 09 81 00 - ACOUSTICAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Provide sound insulation as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 06 Section “Wood Framing”
   2. Division 07 Section “Thermal Insulation.”
   3. Division 07 Section “Joint Sealants”
   4. Division 09 Section “Gypsum Board Assemblies”

1.03 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency
   1. Batt Insulation: flame spread and smoke developed of 0. NFPA 101 Class A.
   2. Other insulation types: As indicated.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original packages, clearly marked with brand name, type and R-Value.

B. Store materials in area protected from weather, moisture and damage, remove any damaged materials from the site.

1.05 SUBMITTALS

A. Samples of materials and complete product and technical description submitted for approval to the Architect prior to ordering materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from fiberglass, slag wool, or rock wool. Unfaced batt insulation, 3-1/2" thick.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas receiving insulation work to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from mortar droppings, grease, oil or other debris which would affect proper insulation. Application constitutes acceptance of substrate conditions.

3.02 INSTALLATION

A. Insulation installed in accordance with current printed recommendations of insulation manufacturer.

B. Install sound batts tightly to studs and to all penetrations. Install tightly fitted and continuously behind and around conduit, boxes, pipe, and other obstructions. Install in full length pieces in each stud cavity to the extent possible to minimize the number of joints at cut ends. Fit cut ends pressed together to ensure a continuous acoustical barrier. Where the stud depth is greater than the nominal batt thickness, cut ends in mats shall be overlapped at least two inches.

END OF SECTION 09 81 00

SECTION 09 91 00 - PAINTING

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. Provide complete surface preparation, priming, field painting and sealing of exposed exterior and interior items and surfaces.
   1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
   2. Examine specifications for various other trades and their provisions regarding their painting. Surfaces that are left unfinished by other sections of specifications shall be painted or finished as a part of this section.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items and finished metal surfaces except where otherwise noted in Drawings or specifications. Do not paint concealed surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork.
      b. Toilet enclosures.
      c. Finished mechanical and electrical equipment.
      d. Light fixtures.
      e. Prefinished wall, roof & soffit panels
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Pipe spaces.
      e. Duct shafts.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
      d. Copper and copper alloys.
      e. Bronze and brass.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
3. Division 6 Section "Architectural Woodwork" for shop priming interior architectural woodwork.
4. Division 7 Section "Joint Sealers ".
5. Division 9 Section "Stucco ".
6. Division 9 Section "Gypsum Board" for surface preparation of gypsum board.
7. Division 32 Section "Pavement Accessories" for traffic-marking paint.

1.03 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit samples on the following substrates for Architect's review of color and texture only:
a. Painted Gypsum Board: 8-inch-square samples for each color and material on hardboard.
b. Ferrous Metal: 4-inch- square samples of flat metal and 8-inch-long Samples of solid metal for each color and finish. (Field installation acceptable).
c. Stucco: 10-inch-square samples for each color. (Field installation acceptable).

C. Qualification Data: For Applicator.

D. The Contractor shall furnish the Owner with a booklet of actual samples of the colors used on the project at project completion.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
   1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
      a. Wall Surfaces: Provide samples on at least 100 sq. ft.
      b. Small Areas and Items: Architect will designate items or areas required.
      c. Portion of all wood to be finished or restored, including windows, doors, frames, rails, etc.
   2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
      a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
   3. Final approval of colors will be from benchmark samples.

D. Materials shall be manufacturer's best grade of respective paint types.

E. Gloss levels for paints required are as per the National Paint and Coatings Association.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in 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. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at an ambient temperature between 45 and 95 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.07 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F 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 manufacturer during application and drying periods.

D. Provide adequate ventilation of spaces while applying primer and finish coats.

E. All application of coatings shall be done under adequate illumination.

1.08 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
   1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

C. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Sherwin-Williams Co. (Sherwin-Williams).

2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: As indicated on drawings.

D. Low-Emitting Materials: Interior paints and coatings 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."

2.03 EXTERIOR PRIMERS

A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
   1. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

B. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
   1. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

C. Exterior Primer for existing ceramic coated sheet metal: Sherwin-Williams B51- 450 Interior/Exterior Multi-Purpose Latex "Adhesion Primer", or approved equal. Applied at a dry film thickness of 1.4 mils.
   1. Adhesion Primer must be topcoated within 14 days of primer application.

D. Exterior Primer for Concrete and Fiber Cement Siding (Hardi Board): Loxon Concrete & Masonry Primer B24W8300: Applied at a dry film thickness of not less than 3.0 mils.

E. Exterior Architectural PVC, Plastic, or Fiberglass: Sherwin-Williams B51- 450 Interior/Exterior Multi-Purpose Latex "Adhesion Primer", or approved equal. Applied at a dry film thickness of 1.4 mils.

2.04 INTERIOR PRIMERS

A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
   1. Sherwin-Williams; ProMar 200 Zero VOC Latex Wall Primer B28W2600 Series: Applied at a dry film thickness of not less than 1.5 mils.

B. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
   1. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

C. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
   1. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.05 EXTERIOR FINISH COATS

A. Exterior Semi-Gloss Acrylic Enamel for Ferrous and Other Metals: (Lintels, Trim, etc): Factory-formulated semi-gloss waterborne acrylic-latex enamel for exterior application.
   Sherwin-Williams; Pro Industrial Acrylic Semi-Gloss B66-650 Series: Applied at a dry film thickness of not less than 2.5 mils.

B. Exterior Wood, Cement, or Brick Satin Finish: Sherwin-Williams A-100 Exterior Latex Satin, A82-100 Series. Applied at a dry film thickness of not less than 1.5 mils.

C. Exterior Textured Coating: Sherwin-Williams Ultra Crete Medium Textured Coating, A44W811. Applied at 50-80 sq. ft/gal.

2.06 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application: ProMar 200 Zero VOC Interior Latex Flat. Applied to a dry film thickness of not less than 1.6 mils.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel: Promar 200 Zero VOC Interior Eg-Shel. Applied to a dry film thickness of not less than 1.7 mils.

C. Interior Full-Gloss Alkyd Enamel for Wood and Metal Surfaces: Factory-formulated full-gloss alkyd interior enamel.
   1. Sherwin-Williams; ProMar 200 Alkyd Gloss Enamel B35-200 Series: Applied at a dry film thickness of not less than 1.5 mils.

D. Interior Full Gloss Epoxy:
   1. Sherwin-Williams; Tile-Clad High Solids Epoxy B62Z series: Applied at a dry film thickness of not less than 2.5 mils.

E. Interior Precatalysed Water-Based Epoxy:
   1. Sherwin-Williams; Pro Industrial Pre-Catalysed Water-based Epoxy K45-150 Series (Egg-shell): Applied at a dry film thickness of not less than 1.5 mils.
   2. To be installed at (previously painted) interior existing brick and CMU surfaces; and interior plaster surfaces of exterior walls.

2.07 MISCELLANEOUS PAINT PRODUCTS

A. Other materials such as linseed oil, turpentine and shellacs shall be pure and of highest quality.

B. Concrete Floor Sealer: Exposed concrete floor slabs with smooth troweled finish: One coat flood-applied, hardener/densifier. Chemical reactive silicate / siliconate formulation that enhances sheen level of troweled concrete and is designed to mainatin or increase sheen level over time with normal wear. Provide one of the following or approved equal product by another Manufacturer:
   a. Euclid Chemical Company; "Euco Diamond Hard", www.euclidchemical.com.
   b. CureCrete Chemical Company; "Ashford Formula", www.ashfordformula.com.
   c. Dayton Superior; "Sure-Hard Densifier J17", www.daytonchemical.com.
   d. L&M Construction Chemicals: "Seal Hard", www.lmmc.com.

C. Waterbased Epoxy: Catalyzed epoxy meeting requirements of ASTM D3730, equal to Sherwin Williams B67 Series.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers, or remove and re-prime.
   2. Cementitious and Masonry Materials: Prepare brick, concrete, concrete unit masonry, 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 if moisture content exceeds that permitted in manufacturer's written instructions.
   3. Ferrous Metals: Clean ungalvanized 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 SSPC's recommendations.
      a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
      b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
   4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying 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. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Concrete floor surfaces to remain exposed shall be cleaned and properly acid etched per floor sealer manufacturer's instructions. Fill and patch holes, crevices, cracks, etc.. Remove any paint, soil, loose material and dust. Remove oil or grease with a hot TSP solution and rinse thoroughly. Floor to be completely dry prior to etching with muriatic acid and water solution.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
   2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   3. Provide finish coats that are compatible with primers used.
   4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
   5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
8. New rooftop gas piping.
9. All existing and new exterior conduit, gas, water and similar piping at face of exterior walls.

G. Electrical items to be painted include, but are not limited to, the following:
   1. Switchgear.
   2. Panelboards.
   3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that 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 ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque 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.

K. 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.

L. Stipple 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.

M. 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 workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
   1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces prior to final inspection. Comply with procedures specified in PDCA-P1.

3.06 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
      a. Primer: Exterior ferrous-metal primer.
      b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
   1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.

a. Primer: Exterior galvanized metal primer.
b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

C. Cement Fiber Board and Stucco: Provide the following paint finish systems over cement fiber board surfaces:
1. Latex Satin Finish: Two finish coats over primer.
a. Primer: Loxon concrete primer.
b. Finish Coats: latex satin finish.

3.07 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Semigloss Acrylic-Enamel Finish: (typical) Two finish coats over a primer.
a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior semigloss acrylic enamel.
2. Full Gloss Epoxy Finish: (at restrooms, janitor closets, sprinkler rise room, etc): Two finish coats over primer.
a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior polyester epoxy.

B. Ferrous Metal: Provide the following finish systems over ferrous metal:
1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior full-gloss acrylic enamel.

C. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior full-gloss acrylic enamel.

D. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
a. Finish Coats: Interior flat latex-emulsion size.

E. Interior Concrete Floors: Provide the following:
1. 1st coat - Sealer / Reducer (400 SF/gal.)
2. 2nd coat - Sealer / Reducer (600 SF/gal.)
a. Exposed Concrete Finished Floors.

END OF SECTION 09 91 00

SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Markerboards

B. Related Sections include the following:
   1. Division 09 Section “Gypsum Board Assemblies.”
   2. Division 06 Section “Rough Carpentry”, for blocking in walls.
   3. Division 06 Section “Wood Framing”

1.03 QUALITY ASSURANCE

A. Manufacturers: Except as otherwise indicated, major components are to be supplied by one manufacturer and are herein specified by manufacturer and type to define overall quality. Substitutions shall be submitted to the Architect for approval.

B. Basis of Design products are by Claridge Products and Equipment, Inc., Harrison, AR 72602.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specification and installation instructions for each product. Include methods of installation for each type of substrate.

B. Shop Drawings: Submit shop drawings for all products. Include sections of typical installation and complete dimensions. Show details of design, anchorage, and accessories.

1.05 WARRANTY

A. Markerboard - Lifetime of original installation, manufacturer warrants that the porcelain enamel shall not exhibit fading of color, crazing, cracking or flaking.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
   2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

2.02 MATERIALS

A. Markerboard: Porcelain enamel, single piece panel of 24 gauge galvanized sheet steel laminated to 7/16" hardboard or 3/8" particle board with .015" aluminum back sheet laminated to hardboard. Factory assembled, 1/2" thick, square cornered panel equal to

Claridge "LCS Deluxe – 5/8" Face Trim – with Map Rail". Size as indicated on the drawings.

1. Size: 4'-0" tall x widths as shown in Drawings.

B. Trim: Satin anodized extruded aluminum.

C. Wall Anchorage: Angle hangers top and bottom.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that surfaces and internal wall blocking are ready to receive work, and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing surfaces. Verify with Architect horizontal dimensions from perpendicular wall surface.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide 2x8 x stud spacing wood blocking in drywall partitions.

C. Establish top of chalk rail at 34" above finish floor.

D. Secure units level and plumb.

3.03 CLEANING

A. Clean all surfaces in accordance with manufacturer's instructions.

B. Cover all surfaces with protective cover, taped to frame.

C. Remove protective cover at Substantial Completion.

END OF SECTION 10 11 00

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Work includes all labor, materials, equipment and services necessary to furnish and install all signage as shown on the Drawings and as herein specified.

B. Related Sections include the following:
   1. Division 01 - for Project Identification signage.
   2. Division 05 - Section "Metal Fabrications", for vehicular sign posts.
   3. Division 06 - Section "Rough Carpentry", for blocking in walls.
   4. Division 09 - Section "Gypsum Board Assemblies".
   5. Division 10 - Section "Fire Protection Specialties", for fire extinguisher / cabinets signage.
   6. Division 26 - For lighting and electrical requirements for lit signage.
   7. Division 32 - Section "Pavement Specialties", for fire lane, directional, and other pavement markings.

1.03 SUBMITTALS

A. Submit shop drawings for all work for review prior to fabrication of materials. Shop drawings of individual letter signage shall indicate spacing. Shop drawings of all signage shall be drawn to scale, letter characters in type style specified and spacing shown exactly as sign is to be fabricated.

B. Submit samples of all colors for selection by Architect and materials proposed for use prior to fabrication.

C. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Plaque Casting: 6 inches square including border.
   2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
   3. Aluminum: For each form, finish, and color, on 6-inch long sections of extrusions and squares of sheet at least 4 by 4 inches.
   4. Acrylic Sheet: Full size for each color required.
   5. Submit two product sample signs with pictogram, tactile characters, and Braille.

D. Submit sign schedule location key plan for all signage.

E. Sign schedule location key plan: Signage contractor shall submit a first draft sign schedule and location key plan for all signage in editable electronic format (excel preferred). Preliminary submittal shall indicate all proposed sign locations, types, and message copy. Architect will mark up the draft schedule and location plan. Make corrections and resubmit sign schedule and location plan until approved by Architect.
   1. Signage contractor shall spell check all signage copy and inform Architect in the final sign schedule submittal to confirm suspected misspellings.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials properly protected and packaged so that no damage occurs during transit. Materials when delivered, protected by the Contractor against damage or theft.

1.05 QUALITY ASSURANCE

A. Signage shall meet government regulation for raised image signage and criteria of the Americans with Disabilities Act, and Texas Accessibility Standards (TAS).
   1. Contractor shall be responsible for all TAS and local accessibility code signage requirements, regardless of whether they are specifically shown on the drawings or specified herein. Notify Architect of any conflicts or deficiencies. Any signage deficiencies noted by Authorities having Jurisdiction at the conclusion of the project shall be remedied by Contractor at no additional cost to the Owner.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. 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.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of metal finishes beyond normal weathering.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Room Signage shall be Fusion as manufactured by Takeform, 1.800528.1398, www.takeform.net or Architect approved equal.

B. Substitutions: Bidder must obtain prior written approval from the Architect and/or Owner to bid alternates or substitutions to the specification.

2.02 ROOM SIGN STANDARDS

A. It is the intent of these specifications to establish a sign standard for the Owner including but not limited to primary and secondary directories, wall mounted and overhead directional, flag mounted directional, primary room identification, restrooms, conference room, work station ID’s and all code compliant signage.

B. Engineered and tested:
   1. The signage system shall have undergone rigorous testing to ensure longevity and optimal performance. Testing shall include environmental testing to ensure that materials can withstand changes in temperature and humidity without distortion as well as testing to ensure resistance to chemicals and UV effects. Further, mechanical testing shall

ensure that the tensile and pull-out strength of mounting hardware is adequate to ensure a safe installation. Test data shall be included with submittals.

C. Typography:
   1. Type style: see drawings. Copy shall be a true, clean, accurate reproductions of typeface(s) specified. Upper and lower case or all caps shall be as indicated in Sign type drawings and Signage Schedule. Letter spacing to be normal and interline spacing shall be set by manufacturer.
   2. Arrows, symbols and logo art: To be provided in style, sizes, colors and spacing as shown in drawings.
   3. Grade II Braille utilizing perfectly round, clear insertion beads.

D. Color and Finishes:
   1. Colors, patterns and artwork: see drawings.
   2. Message Background: see drawings.
   3. Finishes are to meet current federal ADA and all state and local requirements.

2.03 ROOM SIGNAGE

A. Signage system:
   1. The signage shall incorporate a decorative laminate face with applied graphics including all tactile requirements in adherence to ADA specifications.
   2. All signs, including work station and room ID's overheads and flag mounts, directional and directories shall have matching appearance and constructed utilizing the same manufacturing process to ensure a consistent look throughout.

B. Materials:
   1. Sign face shall be 0.035" (nominal) standard grade, high pressure surface laminate. A painted sign face shall not be acceptable.
   2. The sign shall incorporate balanced construction with the core sandwiched between laminates to prevent warping. Laminate on the sign face only shall not be acceptable.
   3. Tactile lettering shall be precision machined, raised 1/32", matte PETG and subsurface colored for scratch resistance.
   4. Signs shall incorporate a metal accent bar. Bars shall be anodized with a brushed satin finish. Painted bars shall not be acceptable. Refer to drawings.

C. Standard Colors:
   1. Face/background color shall be standard grade, high pressure laminated, all colors and finishes. Refer to drawings.
   2. Standard tactile colors shall match manufacturer's ADA standard color selection. Refer to drawings.

D. Construction:
   1. The signage shall, with the exception of directories and directional, be a uniform 8 ½" width to facilitate inserts printed on standard width paper.
   2. Insert components shall have a .080 thickness non-glare acrylic window and shall be inlaid flush to sign face for a smooth, seamless appearance.
   3. The signage shall include modules allowing for inserts, notice holders, occupancy sliders, marker, magnetic, and cork boards, All modules shall be flush to sign face for a smooth, seamless appearance.
   4. The laminates (front and back) shall be pressure laminated and precision machined together to a 90-degree angle. Edges shall be smooth, void of chips, burrs, sharp edges and marks.

5. The signage shall utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, high pressure laminate sign face. Braille dots are to be pressure fit in high tolerance drilled holes.
6. Braille dots shall be half hemispherical domed and protruding a minimum 0.025".
7. The signage shall utilize a pressure activated adhesive. The adhesivc shall be nonhazardous and shall allow for flexing and deflection of the adhered components due to changes in temperature and moisture without bond failure.
8. All signs shall be provided with appropriate mounting hardware. Hardware shall be finished and architectural in appearance and suitable for the mounting surface.
9. Some signs may be installed on glass. A blank backer is required to be placed on the opposite side of the glass to cover tape and adhesive. The backer shall matche the sign in size and shape.

E. Printed Inserts:
1. The signage shall be capable of accepting paper or acetate inserts to allow changing and updating as required. Insert components shall have a 0.080" thickness non-glare acrylic window and shall be inlayed flush to sign face for a smooth, seamless appearance.
2. The signage contractor shall provide and install all signage inserts.
3. Manufacturer shall provide a template containing layout, font, color, artwork and trim lines to allow Owner to produce inserts on laser or ink jet printer. The template shall be in an Acrobat or Word format (.pdf).

F. Room Sign Types:
1. Code and Facility Signage:

a. Sign Type A	Directory
b. Sign Type B	Directional
c. Sign Type C	Overhead
d. Sign Type D	Evacuation Map
e. Sign Type E	Stairs
f. Sign Type E.2	Restroom
g. Sign Type E.3	Misc. room ID
h. Sign Type F	small room ID
i. Sign Type G	Medium room ID
j. Sign Type G.2	Large room ID
k. Sign Type H	Room ID Changeable Insert
l. Sign Type I	Room ID Changeable Insert
m. Sign Type J	Conference room
n. Sign Type L	Work Station ID
o. Sign Type M	Flag Mount
p. Sign Type N	Interor Stairwell
q. Sign Type S	Free-Standing (Stance)

2.04 OTHER SIGNAGE

A. Exterior Vehicular Traffic Signage: Provide 16 Gauge galvanized steel with 1" radius corners, shop painted and screw attached to posts set in concrete footing. Refer to Division 05 Section "Metal Fabrications" for posts. Coordinate lengths of posts for mounting heights compliant with requirements of authorities having jurisdiction. Provide high intensity / photoluminescent grade signs unless otherwise required by authorities having jurisdiction.
1. Vehicular signs at street: Comply with all specifications and requirements of Texas Department of Transportation (TxDOT), or local authority having jurisdiction as applicable, for signs at streets, including but not limited to sign size, gauge, attachment, pole types, and mounting heights. Unless otherwise noted, provide signs designed in

accordance with TxDOT "Standard Highway Sign Designs for Texas" in sizes as follows, or larger where required according to TxDOT design standards for the locations and applications indicated:

a. Do Not Enter Signs: 30"x30".
b. Remote Fire Department Connection (FDC) Sign: To match standards of local authorities having jurisdiction.
    1) If not otherwise specified by authorities having jurisdiction, provide approximately 6”x6” sign, with red background with white border and 3” high white “FDC” lettering, mounted on post 3’ above grade to bottom of sign.

2. Handicap Accessible Parking Signs: Refer to site plan and handicap signage detail on Drawings for parking signage at handicapped accessible spaces. Provide one sign per handicap accessible parking space, one van accessible parking space shall indicate van accessible. Comply with Texas Accessibility Standards requirements for sign types and mounting height.

B. Street Address at Glazed Main Entry Doors: Provide 8" vinyl die-cut, three-digit number in color selected by Architect to be applied to glass above exterior main entrance vestibule doors. Type Style shall be Copperplate Gothic Bold.

C. Signage for Interior Glass Door Lites: Provide 2” vinyl die-cut lettering in color selected by Architect to be applied to glass at doors to court room and council chamber. Type Style shall be Copperplate Gothic Bold.

D. Aluminum Sign Letters: All Sign letters shall be by a single manufacturer or fabricator and shall match in font, color, finish, and other visual characteristics, unless otherwise indicated. Letters and mounting shall be designed by manufacturer to withstand design loads. Type Style shall be as indicated below.
    1. Aluminum Letters at exterior walls, Halo L.E.D. Back-Lit: Cast Illuminated Characters by Gemini, Incorporated or approved equal.
        a. Material: Cast Aluminum with Clear Lexan Back.
        b. Finish: Painted finish on face and sides. Color to be selected by Architect from manufacturer’s full range.
        c. Interior Color: White
        d. Size: 1’-4” high.
        e. Depth of Return: 1” minimum.
        f. Type style: Copperplate Gothic Bold.
        g. Mounting: Mount as per method "Projecting Stud Mount" with anchors and projected 1 inches from wall.
        h. LED Backlight color: White, in color temperature to match all other exterior building-mounted lighting.
    2. Aluminum Interior Sign Letters: Cast Aluminum Characters by Gemini, Incorporated or approved equal.
        a. Material: Cast Aluminum.
        b. Finish: Painted finish on face and sides. Color to be selected by Architect from manufacturer’s full range.
        c. Size: 8” high.
        d. Type style: Copperplate Gothic Bold.
        e. Mounting: Mount as per method "Projecting Stud Mount" with anchors to suit substrate and projected 1 inch from wall.

E. Custom Flat Cut Metal Logos: As manufactured by Gemini Incorporated, or approved equal.
    1. Material: Aluminum.
    2. Thickness: 1/2" Minimum.

3. Finish: Clear Anodized Aluminum.
4. Mounting: Mount as per method "Projecting Stud Mount" with anchors to suit substrate and projected 1 inch from wall.
5. Size and Shape: As indicated on drawings. Vector based linework to be provided by Architect.

F. Custom Fabricated Metal Medallion: As manufactured by Gemini Incorporated, or approved equal.
1. Material: Aluminum.
2. Thickness: As recommended by manufacturer to achieve desired shape.
3. Finish: Painted finish in two colors to be selected by Architect from manufacturer's full range.
4. Mounting: Mount as per method "Projecting Stud Mount" with anchors and projected 1 inches from wall.
5. Size and Shape: As indicated on drawings. Center of star shall project a minimum of 4" beyond back face of medallion.

G. Building Plaque: One Cast Aluminum Plaque, as manufactured by Gemini, Incorporated, or approved equal. Each plaque is to be cast of aluminum and shall be free of pits and holes. Border and letters shall be raised, satin finish and background shall be oxidized, leatherette texture. Plaque shall be cleaned and lacquered. Border shall be single, wide line and lettering shall be type style as indicated in drawings. Mounting to be concealed studs for substrate encountered. Architect shall provide layout and copy requirements for each sign, and Architect and Owner shall approve rubbing prior to casting.

PART 3 - EXECUTION

3.01 EXAMINATION AND COORDINATION

A. Coordinate mounting requirements for exterior substrates with other trades as required, including adequate strength and structural reinforcements where necessary.

B. Coordinate with other trades as required for blocking in walls, electrical requirements, requirements for substrate preparation, and other requirements for signage installation as applicable.

C. Examine installation areas to ensure that conditions are suitable for installation.

D. Examine existing conditions for construction or obstructions that prohibit signage to be installed in typical locations per TAS standards. Where location for TAS compliant mounting location is unclear, request clarification from Architect.

E. Examine signage for defects prior to installation. Do not install damaged signage.

F. Prepare shop drawings and schedule production of dedication plaque with adequate time for review, approval and fabrication to ensure the plaque will be installed at substantial completion, or other date as may be required for dedication ceremony.
1. Submit initial shop drawings no later than 2 months, plus fabrication time, prior to scheduled substantial completion date, to ensure adequate time for Owner review and approval of dedication plaque.

3.02 PREPARATION

A. Verify mounting locations and types prior to fabrication. Coordinate exact locations with Architect where signs cannot be installed in typical location per Texas Accessibility Standards. Confirm where backplates etc. are needed for application to glass or similar substrates.

B. Fabricate signs according to approved shop drawings and sign schedule.

C. Clean mounting locations of dirt, dust, grease or similar conditions that would prevent proper installation. This signage contractor responsible to properly clean substrates so that signage may be properly applied.

3.03 INSTALLATION

A. Install products in accordance with suppliers' instructions, using mounting methods and hardware as specified and as recommended by sign manufacturer for best results.
   1. Mount with mechanical fasteners except at glass. Mount secure and tight to substrates.
   2. Mount with high strength double sided mounting tape, with backplates, at all plaque type signage applied to glass.

B. All signage and materials installed level, plumb, and true in spacing.

3.04 CLEANING, PROTECTION, AND REPAIR

A. Protect installed signage from damage and soiling due to construction operations.
   1. Install interior wall signage after substrates to receive painted finish have been painted, or if painting must be scheduled after initial sign installation mask off or remove and reinstall signs.

B. Remove adhesive, paint, or other spills and smears from sign surfaces, prior to inspection for substantial completion. Clean signs according to manufacturer's or fabricator's instructions. Do not use cleaners or methods that can damage sign surface or finish.

C. Remove any protective coatings at times as recommended by manufacturer or fabricator.

D. Repair scratches and other damage that might have occurred during installation or due to construction operations to satisfaction of the Architect. Evidence of repair should not be visible when viewed with unaided eye at a distance of 5 feet. Remove and replace damaged materials that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 10 14 00

SECTION 10 21 13 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:
   1. Solid plastic toilet compartments, floor mounted, head rail braced.
   2. Attachment hardware.

B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Division 6 Section - Rough Carpentry: Framing and plates within walls for partition attachment.
   2. Division 10 Section - Toilet Accessories: Coordinate compartment installation with subsequent accessory installation.

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

1.03 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.
   1. Product Data: Panel construction, hardware, and accessories.
   2. Shop Drawings: Partition plan, elevation views, dimensions, door swings, details of wall and floor supports and connections.
   3. Samples: Two 2 inch x 3 inch samples of partition indicating finish and color.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to ANSI A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Division 1 Section - Product Requirements: Transport, handle, store, and protect products.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Resource Management:
   1. Recycled Content: Provide solid plastic compartments and screens with core manufactured from minimum 50 percent recycled plastic.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
   1. Capitol Partitions, Incorporated, Columbia, MD (410) 740-8870.
   2. Comtec Industries, Moosic, PA (717) 348-0997 or (800) 551-6993.
   3. Metpar, Corporation, Westbury, NY (516) 333-2600.
   4. Santana, Scranton, PA (800) 368-5002 or (717) 343-7921.

B. Division 1 Section - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.02 MATERIALS

A. Solid plastic compartments and screens: water resistant; graffiti resistant; non-absorbent; with plastic face sheets permanently fused to plastic core.
   1. Panels: 1 inch thickness, 58 inches in height.
   2. Doors: 1 inch thickness, 58 inches in height.
   3. Pilasters: 1 inch thickness.

B. Pilaster Shoes: 4 inches high and 20 gage stainless steel.

C. Attachments:
   1. Screws, and Bolts: Stainless steel; tamper proof type.
   2. Wall Mounting Brackets: Continuous, full height bright anodized aluminum brackets in accordance with toilet compartment manufacturer's instructions.

D. Hardware: Chrome plated non-ferrous cast pivot hinges, gravity type, adjustable for door close positioning; nylon bearings; black anodized aluminum door latch; door strike and keeper with rubber bumper; cast alloy chrome plated coat hook and bumper.

2.03 FABRICATION

A. Solid Plastic: 1/4 inch radius beveled edges.

B. Hardware and Attachments: Pre-drilled by manufacturer; provide for protection of dissimilar metals.
   1. Floor Mounted Anchorage: Corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

2.04 FINISHES

A. Compartments and Screens: As selected by Architect from manufacturer’s standard colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 1 Section - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify correct spacing of plumbing fixtures.
   2. Verify correct location or built-in framing, anchorage, and bracing.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, level, and square in accordance with published manufacturer's instructions.
   1. Provide for adjustment due to minor floor variations.
   2. Install adjacent components for consistency of line and plane.

B. Maintain 1/2 inch space between wall and panels, and between wall and pilasters. Attach panel brackets securely to walls using anchor devices.

C. Attach panels and pilasters to bracket with through sleeve tamperproof bolts and nuts. Locate head rail joints at pilaster center lines.

D. Conceal floor fastenings with pilaster shoes.

E. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors, not exceeding 1/4 inch.
   1. Provide hardware at handicapped toilet with operating hardware complying with ANSI A117.1.

3.03 CONSTRUCTION

A. Interface with Other Work:
   1. Coordinate placement of support framing and anchors in walls.

B. Site Tolerances:
   1. Maximum Variation From True Position: 1/4 inch.
   2. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. In Swinging Doors: Adjust hinges to locate doors in partial open position when unlatched.

C. Out Swinging Doors: Adjust hinges to gently return doors to closed position.

D. Adjust adjacent components for consistency of line or plane.

3.05 ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Clean Surfaces: Use non-toxic materials and procedures.
   2. Remove protective masking.

END OF SECTION 10 21 13

SECTION 10 22 26 - OPERABLE PARTITIONS

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. Section Includes: Furnish and install Manually Operated, Paired Panel Operable Partitions
   1. Provide all labor, materials, tools, equipment, and services for operable partitions in accordance with provisions of contract documents.

B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections include the following:
   1. Division 5 Section “Structural Steel.”, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
   2. Division 6 Section “Blocking.”
   3. Division 8 Section “Hardware.”
   4. Division 9 Section “Painting.”
   5. Division 9 Section “Acoustical Insulation”
   6. Division 9 Section “Gypsum Boarad Assmeblies”

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Operable Partitions."

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.05 SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

B. Shop Drawings: Show location and extent of operable partitions. Include plans, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating

clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

1.06 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Partition Warranty period: Two (2) years from date of substantial completion.

C. Suspension System Warranty: Ten (10) years from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS & PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Modernfold, Inc.

B. Products: Subject to compliance with the requirements, provide the following product:
   1. Acousti-Seal #932 manually operated paired panel operable partition.

2.02 OPERATION

A. Acousti-Seal #932: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.

B. Final Closure: Horizontally expanding panel edge with removable crank

2.03 PANEL CONSTRUCTION

A. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel skin shall be: 0.50-inch (13mm) NAUF medium density fiberboard, single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction: 50 STC

C. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be: Full leaf butt hinges, attached directly to the panel frame. Welded hinge anchor plates within panel shall further support hinge mounting to frame. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights: 50 STC - 8 lbs./square foot

2.04 PANEL FINISH

A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be: Wall covering and upholstery fabric with surface treatment to resist stains.

B. Panel Trim: Exposed panel trim of one consistent color, as selected by Architect from manufacturer's full range.

2.05 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal bottom floor seals shall be: Modernfold IA2 Bottom seal. Automatic operable seals providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50-inch (13mm) to -1.50-inch (38mm) which automatically drop as panels are positioned, without the need for tools or cranks.

2.06 SUSPENSION SYSTEM

A. #14 Suspension System
   1. Suspension Tracks: Minimum 7-gauge, 0.18-inch (4.57mm) roll formed steel. Static loading of track with brackets at 48-inch (1220mm) centers shall show no failure of track or brackets at 5,000 pounds (2550kg) point loading at mid-span. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 0.50-inch (13mm) diameter threaded rods. Brackets must support the load bearing surface of the track.
      a. Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.
   2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

B. Install operable partitions and accessories after other finishing operations, including painting have been completed.

C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.02 CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.03 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.04 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION 10 22 26

SECTION 10 26 14 - WALL AND CORNER PROTECTION

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. Section Includes:
   1. Work includes all labor, materials and services necessary to furnish and install all wall and corner guards as shown on drawings and as herein specified.

B. Related Sections include the following:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.
   2. Division 7 Section: Caulking & Sealants
   3. Division 9 Section: Gypsum Wallboard
   4. Division 9 Section: Painting

1.03 SUBMITTALS

A. Submit shop drawings, product data and installation instructions.

B. Provide samples of manufacturer's standard color range.

PART 2 - PRODUCTS

2.01 WALL GUARDS

A. Surface-Mounted Corner Guards: Shall be manufactured by InPro. 160 High Impact, 2" wing, or approved equal by Balco, Johnsonite, Construction Specialties, or Pawling Corp.
   1. Flame spread shall be 25 or less in accordance with ASTM E84.
   2. Snap-on-Covers shall be scratch & stain resistant rigid vinyl with thickness: .080" (2mm).
   3. Continuous aluminum retainer, .070" thickness, anchored to wall at 18" O.C. with self tapping screws.
   4. Accessories: Provide screws and all necessary attachment hardware to complete the assembly.
   5. Color: as selected in the finish schedule.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install at heights indicated on the drawings.

B. Install with top aligned as shown on drawings, unless otherwise directed by Architect. Where corner guard top elevation is not shown on drawings, corner guards shall be full height to ceiling, with bottom edge mounted at top of wall base.

C. Install wall and corner guards plumb, level and rigidly secure in place in accordance with manufacturer's instructions.

D. Mounting retainer shall be set a maximum of 18" on centers.

E. Retainers for flush-mounted corner guards shall be installed prior to application of drywall.

F. Vinyl acrylic extrusions shall be installed after painting or wall covering has been completed.

END OF SECTION 10 26 14

SECTION 10 28 13 - TOILET ACCESSORIES

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. Section Includes:
   1. Provide accessories as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 6 Section: Blocking in Stud Walls for Accessories
   2. Division 10 Section: Plastic Toilet Compartments

1.03 QUALITY ASSURANCE

A. Model numbers listed for toilet accessories are items manufactured by Bobrick Corporation. Items as made by the Bradley Corp., American Specialties Co. Charles Parker Co. may be used provided materials meet performance and design requirements herein specified.

B. All bathroom fixtures and accessories shall comply with all ADA federal, state and local Handicapped code requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's unopened protective cartons. Maintain covers on units until installation is complete. Remove protective covers at final clean-up of installation.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 ITEMS

A. Soap Dispensers:
   1. Disposa-Valve Soap Dispenser, Stainless Steel, Surface Mounted, designed to accept pre-packaged 800ml soap cartridges, equal to American Specialties, Inc. No. 5001-SS.

B. Paper Towel Dispenser / Waste Receptacle:
   1. Recessed mounted stainless steel paper towel dispenser and semi-recessed waste receptacle, equal to American Specialties, Inc. No. 6467.

C. Toilet Tissue Dispenser:
   1. Surface-mounted: Double roll holder with shelf, equal to American Specialties, Inc. No. 0697-GAL.

D. Undersink Pipe Insulation: ADA compliant vinyl cover pipe insulation shall be TRUEBRO "Lav Guard 2", as manufactured by ISP Corp., in standard color, or approved equal.

E. Grab Bars: 1-1/2" diameter satin finish stainless steel grab bar sets with concealed fastenings. American Specialties Inc. Series 3800. Lengths and mounting configurations shall comply with all state and local Handicapped Accessibility code requirements.

F. Mirrors:
   1. Framed Wall Mirrors: No. 1 quality 1/4" float plate glass selected for silvering, electro-copper plated by galvanic process, surface-mounted mirror with stainless steel channel and filler strip on 1/8" non-abrasive polyethylene padding equal to American Specialties Inc. No. 0605-2436.
   2. Unframed Plate Glass Mirrors: No. 1 quality 1/4" float plate glass selected for silvering, electro-copper plated by galvanic process, surface-mounted mirror with polished edges equal to American Specialties Inc. No. 8287.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All handicapped bathroom fixtures and toilet accessories shall comply with all federal, state and local Handicapped code requirements and comply with TAS (Texas Accessibility Standards) mounting locations and heights.

3.02 INSPECTION

A. Inspect blocking and plate inserts in framing to determine if material is in proper position for installation of accessories prior to wallboard surfacing being applied. Units securely attached to framing. Grab bars installed to withstand a 900 lb. loading condition; provide necessary concealed anchorage devices to meet load requirements.

END OF SECTION 10 28 13

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

1.01 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.

1.02 DESCRIPTION OF WORK

A. Definition: "Fire extinguisher" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.

B. Types of products required include:
   1. Fire extinguishers.
   2. Fire extinguisher cabinets.
   3. Fire extinguisher brackets.
   4. Fire Department Key Vaults (Knox boxes).

C. Related Sections include the following:
   1. Division 04 - Section "Manufactured Stone", for coordination of block-outs in masonry walls.
   2. Division 06 - Section "Rough Carpentry", for coordination of blocking in walls.
   3. Division 07 - Section "Joint Sealants".
   4. Division 09 - Section "Gypsum Board Assemblies".
   5. Division 21, for coordination with fire sprinkler system design.
   6. Division 26, for coordination of pathway for Knox Box security system connection.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this section from one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.04 SUBMITTALS

A. Submittal shall include manufacturer's product literature, both pictorial and written.

PART 2 - PRODUCTS

2.01 PORTABLE TYPE FIRE EXTINGUISHERS

A. Manufacturers: Design is based on products as manufactured by Activar / J.L. Industries, Inc. or Larsen's Manufacturing Co. Subject to compliance with requirements, provide the named products, or approved equal by another manufacturer.

B. Multi-purpose Class ABC Fire Extinguishers: Provide all extinguisher cabinets with ABC type extinguishers unless otherwise noted. ABC Fire extinguishers shall be a multi-purpose dry chemical type, enameled metal containers with pressure indicating gauges, rated for Class A, B, and C fires.
   1. At Fire Extinguisher Cabinets, provide 10 lb extinguishers, 4A-80BC rated, equal to the following:
      a. J. L. Industries Model Cosmic 10E, with MB846A bracket at bracket mounted locations.
      b. Larsen’s Model MP10 with nozzle, with B-2 bracket at bracket mounted locations.

2. Where locations for specified extinguishers are not indicated in Drawings, confirm exact locations with Architect.

C. Fire Extinguisher Cabinets: Provide semi-recessed, one-piece steel cabinet with stainless steel finish with rolled–edge trim. Semi-recessed cabinets shall not project more than 4" from face of wall, and overall depth sized to fit specified fire extinguishers. Provide recessed handle where 4" projection of the cabinet is required. Top of rough opening for unit shall be at 54"above finished floor surface, unless otherwise dictated by governing authority. Cabinets shall be J.L. Industries Ambassador series or approved equal.
   1. Semi-recessed at typical stud construction: Designed to recess into 3-5/8" stud wall construction (nominal 4" recessed).
   2. Finish: Enamel coated steel.
   3. Door Style: Full glass with pull.
   4. Glazing: Clear Acrylic.
   5. Lettering: 17R, diecut, vertical, white, in reverse, #LDCVWRFE

D. Fire Department Key Vault for Building access: Provide equal to Knox “Knox-Vault 4400 Series” single lock model, recessed mount with recessed mounting kit. Provide all hardware and accessories as required for complete, secure mounting and installation at wall construction indicated.
   1. Finish: Aluminum.
   2. Provide with tamper alarm switch.

E. Anchors: Provide non-corrosive types as required by wall conditions.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in location and at mounting height indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities as directed by local fire marshal.

B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.

C. Fire Department Key Vault: At key vaults located on exterior building walls, wire tamper switch to building security system as shown in Drawings or specified elsewhere. Or where security system is not part of project scope or not indicated for key vault to be wired to security system, provide empty conduit with pull wire to above nearest accessible ceiling for future security system connection.

D. Remove protective plastic sheets prior to Architect's inspection for substantial completion.

END OF SECTION 10 44 00

SECTION 11 15 00 - AFTER-HOURS DEPOSIT BOX

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. Section Includes:
   1. Provide after-hours deposit box as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 04 Section “Manufactured Stone”
   2. Division 06 Section “Rough Carpentry”
   3. Division 06 Section “Wood Framing”
   4. Division 06 Section “Interior Architectural Woodwork”
   5. Division 09 Section “Gypsum Board Assemblies”

1.03 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Hamilton Safe, Inc.

1.04 SUBMITTALS

A. Shop drawings, manufacturer's standard brochures and details based on the contract documents submitted to the architect for review and approval.

PART 2 - PRODUCTS

2.01 ITEMS

A. After-hours deposit box shall be “Drop Box” as manufactured by Hamilton Safe, Inc.
   1. Model Number: 145 DB (no slowdown chute)
   2. Material: Stainless Steel Exterior; Interior Painted Black
   3. Hopper Clear Opening Dimensions: 14 3/4" Wide; 5 1/2" High; 12 1/2" Deep
   4. Masonry Opening Dimensions: 17 1/4" Wide; 8 1/2" High
   5. Slowdown Chute: Provide unit WITHOUT slowdown chute, as it will empty directly into a cabinet with a drawer, as indicated in drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor to examine all components and operation prior to installation. Field measurements must be verified.

3.02 INSTALLATION

A. Materials installed level, plumb, straight and true to line. Penetration through building envelope properly flashed and sealed in accordance with drawings and Division 07 Specififcations. Operable mechanisms properly adjusted.

END OF SECTION 11 52 13

SECTION 11 33 00 – RETRACTABLE STAIRS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section Includes:
   1. Manual disappearing stairways.

1.02 REFERENCES

A. ANSI A14.9: Safety Requirements for Ceiling Mounted Disappearing Climbing Systems.

1.03 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures”.

B. 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. Shop Drawings for Stairs:
   1. Plan and section of stair installation.
   2. Indicate rough opening dimensions for ceiling and/or roof openings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store stairway until installation inside under cover in manufacturer's unopened packaging. If stored outside, under a tarp or suitable cover.

1.05 WARRANTY

A. Limited Warranty: One year against defective material and workmanship, covering parts only. Defective parts, as deemed by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Manufacturer: Precision Ladders, LLC, P. O. Box 2279; Morristown, TN 37816-2279; Tel: 423-586-2265; Fax: 423-586-2091; www.PrecisionLadders.com

B. Requests for substitutions will be considered in accordance with provisions of Division 01 Section "Substitution Procedures".

2.02 MANUAL DISAPPEARING STAIRWAY.

A. Manual Disappearing Stairway.
   1. Standard Model: Super Simplex Disappearing Stairway as manufactured by Precision Ladders LLC. Model SS/AL-9.

B. Performance Standard: Unit shall comply with ANSI A14.9, Commercial Type, for rough openings between 25-1/2 inches to 39 inches. Stairway capacity shall be rated at 500 lbs.

C. Accessories:
   1. Steel pole to aid opening and closing stairways.
   2. Stairs shall be equipped with a patented Precision Fold Assist to aid in folding and unfolding of sections.

D. Components:
   1. Ceiling Opening: 30" x 54"
   2. Stairway Stringer: 6005-T5 Extruded aluminum channel 5" x 1" x 1/8"; tri-fold design; steel blade type hinges; adjustable feet with plastic Mar-guard. Pitch shall be 63°.
   3. Stairway Tread: 6005-T5 extruded aluminum channel 5 3/16 inches by 1 1/4 inches by 1/8 inch. Depth is 5 3/16 inches. Deeply serrated top surface. Riser Height: 9-1/2 inches. Clear Tread Width for Standard Width: 19-1/2 inches.
   4. Railing: Aluminum bar handrail riveted to stringers, upper section only.
   5. Frame: 1/8" steel, 63° (with built-in steps) on the hinge end, 90° on the other end, custom depth to fill distance from ceiling to attic subfloor above. This custom frame will require a longer opening in the attic subfloor than is required at the ceiling level.
   6. Door Panel
      a. Standard (non-fire rated) door shall be constructed of 1/8 inch (3 mm) aluminum sheet attached to stairway frame with a steel piano hinge. Door overlaps bottom flange of frame. Eye bolt accommodates pole for opening and closing door. Door shall be painted to match ceiling color per Division 09 Section "Painting".
   7. Hardware:
      a. Steel blade type hinge connecting stringer sections. Zinc plated and chromate sealed.

b. Steel operating arms, both sides. Zinc plated and chromate sealed.
c. Double acting steel springs and cable, both sides.
d. Rivets rated at 1100 lb (499 kg) shear strength each.
e. Steel section alignment clips at stringer section joints.
f. Molded rubber guards at corners of aluminum door panel.

8. Finishes: Mill finish on aluminum stairway components. Prime coat on frame.

2.03 FABRICATION

A. Completely fabricate ladder ready for installation before shipment to the site.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until rough opening and structural support have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 11 33 00

SECTION 11 52 13 - PROJECTION SCREEN

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. Section Includes:
   1. Provide projection screen as shown on the drawings and as herein specified.

B. Related Sections include the following:
   1. Division 06 Section “Rough Carpentry”
   2. Division 09 Section “Gypsum Board Assemblies”

1.03 QUALITY ASSURANCE

A. Acceptable Manufacturers:
   1. Draper, Inc.
   2. Da-Lite Projection Screens

1.04 SUBMITTALS

A. Shop drawings, manufacturer's standard brochures and details based on the contract documents submitted to the architect for review and approval.

PART 2 - PRODUCTS

2.01 ITEMS

A. Ceiling Recessed Projection Screen shall be electric motor operated by Draper, “Access/Series V”, or approved equal.
   1. Case Color: White
   2. Viewing Surface: Pure White XT1300V
   3. Motor: 110-120V AC Quiet Motor
   4. Switch: White switch with white faceplate
   5. Size: As indicated on drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor to examine case, screen, and operation prior to installation. Field measurements must be verified.

3.02 INSTALLATION

A. Materials installed level, plumb, straight and true to line. Corner and edges properly closed without any gaps. Operable mechanisms properly adjusted. Securely attach case to bottom side of structure.

END OF SECTION 11 52 13

SECTION 12 21 00 - WINDOW BLINDS

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. Section Includes: Horizontal blinds.

B. Related Sections include the following:
   1. Division 06, Section "Rough Carpentry".
   2. Aluminum Storefront Windows: Division 8 Sections.
   3. Division 09, Section "Gypsum Board Assemblies".
   4. Division 09, Section "Painting", for coordination in scheduling painting to prevent staining of blinds.

1.03 QUALITY ASSURANCE

A. Provide window treatment units which are complete assemblies produced by one manufacturer for each type required, including hardware, accessory items, mounting brackets, and fastenings.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, product literature and installation instructions for each type of window treatment unit required. Include methods of installation for each type of opening, supporting structure, and shop drawings showing sizes. Submit samples of each component, material & finish which will be exposed to view. Prepare samples from same materials to be used for the work. Submit complete range of standard colors for each product for selection by Architect.

1.05 COORDINATION

A. Cooperate with other trades for securing to substrates and other finished surfaces.

1.06 GUARANTEE

A. Blinds and louvers shall be guaranteed against warp, twist, bow, brittleness and color change. Contractor will provide replacement blinds or louvers for faulty units for a period of three years.

PART 2 - PRODUCTS

2.01 HORIZONTAL BLINDS

A. General: Acceptable Manufacturers shall be Levolor, Hunter Douglas or approved equal.

B. Headrail: Manufacturer's standard headrail consisting of channel-shaped section fabricated from minimum 0.024" thick sheet steel with rolled edges at top. Increase metal thickness as recommended by manufacturer for large blind units. Furnish complete with tilting mechanism, top and end braces, top cradles, cord lock, and accessory items required for type of blind and installation indicated.

1. Where arched mini-blinds are indicated on drawings for arched windows, provide a curved headrail matching the radius of the window. Slats within arched portion of window will not collapse when the bottom rail is raised, but shall be tiltable.

C. Bottom Rail: Manufacturer's standard tubular steel bottom rail, designed to withstand twisting or sagging. Contour top surface to match slat curvature, with flat or slightly curved bottom. Close ends with manufacturer's standard metal or plastic end caps, or same color as rail. Finish rail in same color as slats, unless otherwise indicated.

D. Slats: Manufacturer's standard, spring-tempered aluminum slats, 0.008" thick, (louver blade), with rounded corners and forming burrs removed, as follows:
   1. Slat width: 1" narrow slats, with other components sized to suit. Slat shall be continuous across entire opening.
   2. Provide slats designed and spaced to achieve maximum overlap and closure of optimum light exclusion. Notch rear of blade at ladders and offset route holes at lift cords to enable blades to touch one another when closed.
   3. Finish shall be as selected by Architect from Manufacturer's standard color options.

E. Ladders: Manufacturer's standard ladder construction designed to support and maintain slats at proper spacing and alignment in open and closed positions, as follows:
   1. 100% polyester cord design consisting of vertical components of not less than 0.045" nor more than 0.066" in diameter and integrally braided ladder rungs of not less than 4 threads; space ladders not further than 24" apart and 7" from ends of slats.

F. Tilting Mechanism: Manufacturer's standard assembly including low friction gear tilter, drum and cradle at each ladder, tilt road, tape clips, and grommet guides to prevent wear on ladder and cords; designed to hold slats at any angle and prevent movement of slats due to vibration, operated as follows:
   1. Wand Operation: Manufacturer's detachable clear plastic wand, or proper length to suit blind installation and to provide convenient operation.
   2. Cord Operation: Manufacturer's standard matching lift cord in material, size, and appearance, fitted with 1" diameter metal ring and proper length for blind installation.

G. Lifting Mechanism: Manufacturer's standard including crash-proof cord locks with cord separators and 100% polyester lift cords with ring at ends. Size cord to suit blind type. Include cord equalizers of self-aligning type designed to maintain horizontal blind position.

H. Installation Brackets: Manufacturer's standard brackets designed to facilitate removal of head channels. Provide intermediate brackets at spacing recommended by blind manufacturer. Include hardware necessary for secure attachment of brackets adjoining construction and to head rails. Design brackets to support safely the weight of blind assemblies plus forces applied to operate blinds. Attach to substrate at 3'-0" O.C. minimum or less as required by manufacturer.

I. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings. Cooperate with other trades for securing tracks to substrates and other finished surfaces.

J. Full-tilting operation with slats rotating approximately 180 degrees.

K. Full-length recalling and/or raising, to manufacturer's minimum stacking dimension. Horizontal blinds with lifting cord locks for stopping blind at top position only and pull cords on right hand side of blind units, unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF BLINDS

A. Install units securely to head in manner to comply with manufacturer's instruction. Position units level, plumb, secure, at proper height and location relative to adjoining elements and other related work.

B. Provide adequate clearance between sash and blinds to permit unencumbered operation of sash hardware.

C. Protect installed units to ensure their being in perfect operating condition, without damage, blemishes, or indication of use at completion of project. Repair or replace damaged units as directed by Architect.

3.02 CLEANING

A. All slats, louvers, head rails, etc., shall be properly cleaned prior to final inspection.

END OF SECTION 12 21 00

SECTION 14 92 00 – PNEUMATIC TUBE SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Pneumatic tube system

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete".
   2. Division 26 Section "Electrical".

1.03 SUBMITTALS

A. Comply with pertinent provisions of Division 01 Section “Submittal Procedures, unless otherwise indicated.”

B. Product Data: For the pneumatic tube system indicated. Include construction details, materials, individual components and profiles, and finishes.

C. Shop Drawings: Show installation details of stations, tubing, airline, air power unit, and central control. Include plans, elevations, sections, details, and attachments to other work.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain pneumatic tube system through one source from a single manufacturer.

B. The installation shall be made by the pneumatic tube system contractor or his authorized representative.

C. The total responsibility for materials, installation, warranty, and instruction in operation and maintenance shall be directly with the pneumatic tube system contractor.

1.05 COORDINATION

A. Verification: Determine specific locations and sizes for components of pneumatic tube system. Contractor shall be responsible for all electric power wiring, terminations, power supply and telecommunications cabling necessary for the system.

1.06 WARRANTY

A. Manufacturer's Standard Warranty: Material and workmanship shall be warranted by the contractor to be free from defects, if properly operated and maintained, for a period of one year from the date of substantial completion. Any part proven defective shall be replaced at no charge. Normal wear on airtube system carriers is not under warranty.

PART 2 - PRODUCTS

2.01 PNEUMATIC TUBE SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Aerocom Systems.

B. Pneumatic Tube System:
   1. 5000-RT Drive-up Pneumatic Tube System
      a. The system shall be a point-to-point system designed to allow two-way transfer of carriers only between master station and its interconnected substation with remote vacuum-pressure blower unit located in the customer unit. Stations (Send/Receive) shall be provided in locations as shown on drawings.

C. System Design:
   1. The System shall consist of transmission tubing, airline, stations, air power unit, central control and carriers.
   2. Transmission tubing shall be arranged into a two-way reversing single line connecting the master station and the substation.
   3. Stations shall consist of terminals capable of carrier dispatch and receive.
   4. An Air Power Unit shall be provided supplying air in the vacuum or pressure mode automatically, as required.
   5. Carriers shall be designed for bi-directional travel. Provide 2 carriers for each station.

D. System Operation:
   1. A carrier shall be prepared for dispatch from a station by placing the carrier into the sending unit and activating the dispatch function, allowing the carrier to enter the system.
   2. The dispatch carrier shall be moved to its destination by negative or positive air pressure through the tubing at an average speed up
   3. to 25 FPS.
   4. Stations shall be equipped with air diodes for soft delivery of carriers. Delivery of carriers into a terminal under direct air power will not be allowed.

E. Line Material:
   1. Tubing and bends shall be galvanized steel. Transmission tubing and bends shall be nominal 4 ½" outside dimension, designed and formulated for use as pneumatic transmission line material. Schedule 40 PVC as manufactured for electrical or plumbing industry shall not be acceptable. Physical properties shall include non-corroding self-extinguishing, antistatically treated, light deformation, resistant and extruded to tight tolerances throughout. Air supply tubing shall be size as required for proper system operation. Bends shall be a nominal 30" radius.
   2. Tubing joints shall be either solid or clamp type sleeves and shall be air tight.
   3. Tubing hangers shall be plated or painted clamps and threaded rods attached to suitable anchors. Horizontal tubing shall be supported at each bend or each length of straight tubing and vertical tubing shall be supported at each floor and/or 8 foot centers between each floor. Strapping of tube directly to structural members or other piping shall not be acceptable.

F. Station Equipment:
   1. Stations - (Send/Receive):
      a. Stations, master or substation, shall be oriented for carrier arrival/dispatch from above and shall be suitable for counter or free standing installation.
      b. Stations shall consist of an automatic door opening gate that is closed while receiving a carrier to ensure soft delivery of the carrier.
      c. Station controls shall be equipped with a LED readout that will indicate the status and operation of the system.
      d. Customer Unit shall have a 10" color monitor for two way video and two way audio communication.
      e. Customer Unit shall have a tilt camera controlled by a matrix in the Teller area.
      f. All components shall be UL rated.

G. Air Powered Unit(s):
   1. Each system shall have an Air Power Unit (APU), operating in the vacuum or pressure mode as required, supplying sufficient air volume to move the carrier successfully through the System.
   2. The APU shall be controlled through the main system control and built into the outlying drive up terminal.

H. Central Control:
   1. The central control shall perform all logic and control functions and provide permanent storage for the system operating program.
   2. Interface controls shall communicate operating data to and from the stations and APU, enabling "central" to supervise and command system operation to and from the stations. Controls shall be modular, using solid state component. For ease of maintenance and service, the circuit module shall be readily removable.
   3. The standard control unit shall have these capabilities:

a. Supervise carrier dispatch, travel and arrival functions, ensuring a carrier leaves and arrives.
b. Command and exercise the operations of system components.
c. System purge - will clear the system of all traffic upon command.
d. Auto power down minimizes energy usage by shutting down the APU when there are no transmissions, and reactivating on command.
e. Activate system alarm if a carrier is not transported properly or does not reach its destination.
f. Operate system diagnostic routine by displaying requested information.
g. System shall have two-way audio and two-way video built into the customer terminal and teller terminal.

4. Power packs shall be provided to supply 24 VDC control power as required throughout the system.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify that the airtube system may be installed in accordance with approved shop drawings.

B. Notify at once of any discrepancy. Proceed with installation only after unsatisfactory conditions have been corrected.

C. The entire installation shall meet latest applicable ordinances, codes and regulations of the installation locale.

3.02 INSTALLATION

A. The Contractor's installation personnel shall organize their work and maintain orderly/clean conditions relating to the installation.

B. General: Comply with manufacturer's written instructions.

C. Built-in Equipment: Securely anchor units to supporting substrates with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

D. Utilities: Refer to Division 26 for electrical requirements

3.03 CLEANING AND PROTECTION

A. Test each item of pneumatic tube system to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from airtube system and leave units in clean condition, ready for operation.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Division 01 Section "Demonstration and Training."

B. Provide 3 copies of an Owner's Operation and Maintenance Manual which shall contain operation, maintenance and repair instructions.

END OF SECTION 149200

SECTION 21 00 00 - FIRE PROTECTION GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
   1. The scope of work described in these Specifications and/or indicated on the Drawings shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all systems. All work shall be accomplished by workmen skilled in the various trades involved.

B. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the Architect shall be notified of the discrepancy.

C. All work performed under this specification shall be accomplished in accordance with the requirements and provisions of Section 23 00 00 - HVAC General.

1.02 SYSTEMS

A. Systems to be provided under the Fire Protection design section shall be as listed below. The connection point to the site utility service for the fire protection system shall be at 5'-0" from the exterior of the building unless specifically otherwise noted.
   1. Automatic Sprinkler Systems
   2. Fire Department Valve Cabinets
   3. Painting of exposed piping

1.03 QUALIFICATION OF CONTRACTORS

A. The Contractor for the fire protection installation shall be a certified fire protection contractor, licensed for the installation of automatic fire sprinkler systems and other fire protection equipment.

1.04 DESIGN STANDARDS

A. Fire Protection systems shall be designed and installed in accordance with the requirements of the following codes, standards and design guides:
   1. The International Fire Prevention Code, 2012 Edition, with local Amendments.
   2. The International Building Code, 2012 Edition, with local Amendments.
   3. National Fire Protection Association (NFPA) Standards:
      a. NFPA 13 - Installation of Sprinkler Systems, latest edition.
   4. Factory Mutual (FM) Approval Guide
   5. Underwriters Laboratories Inc. (UL)

6. Owner's Insurance Underwriter Requirements.

B. Design Criteria
   1. Upon award of the Contract, a new flow test from the two (2) hydrants nearest the site service entry is to be performed by the Contractor to confirm the flow and pressure characteristics of the existing water service. The completed flow test data along with a utility service map of the area is to be forwarded to the Engineer for confirmation of the existing water service.
   2. The entire facility will be protected by an automatic sprinkler system supplied by combination fire standpipe/automatic sprinkler systems located within the building where shown on the drawings.
   3. Automatic sprinkler systems shall be designed to the available domestic water pressure available and shall be hydraulically calculated for the following design standards:
      a. NFPA 13 Systems

Area/Usage	Hazard Classification	Density GPM/Sq. Ft.	Remote Area	Maximum Head Spacing	Interior Hose Stream
Public Spaces, Lobbies, Corridors, Offices, Restaurants, Lounges, Meeting Rooms and Dwelling Units	Light	.10	1,500 sq. ft.	225 sq. ft.	100 gpm
Mechanical Rooms, Maintenance / Storage Rooms,	Ordinary Group 1	.15	1,500 sq. ft.	130 sq. ft.	250 gpm
Dry Pipe Systems: Parking Garages, Non-heated Attic Spaces, Ceiling Spaces, Porte Cochere and other spaces containing sprinkler piping that do not have alternate provisions to guarantee a 40° F temperature.	Ordinary Group 1	.15	1,950 sq. ft.	130 sq. ft.	250 gpm

   4. The fire protection systems shall not be designed to operate if the residual pressure of the existing water service falls to 20 psi or lower at design flow requirements.
   5. The fire protection system design shall include a minimum of 10 psi safety factor to allow for future losses in the water service pressure characteristics.
   6. The maximum allowable system velocities shall not exceed 20 fps unless alternate criteria are required by the Owner's Insurance Underwriter.
   7. The automatic sprinkler design criteria may be hydraulically calculated for the room design method as outlined in NFPA 13 if acceptable to the local governing authorities and the Owner's Insurance Underwriter.

C. Fire Protection System Alarms
   1. All control valves in the fire protection system shall be provided with tamper switches wired for annunciation at the main FACP.
   2. Automatic sprinkler system connections shall be provided with flow switches adjacent to the zone control valve wired for annunciation at the main FACP.
   3. Upright automatic sprinklers will be provided in all areas with exposed structure.

1.05 ORDINANCES, PERMITS AND DRAWING APPROVALS

A. The Contractor shall file all requisite plans relating to this section of the specifications with the proper authorities, secure all permits and approvals and pay all resultant fees for work done under this section.

B. All fire protection work shall comply with all laws, ordinances, rules, regulations and standards of the City, County, State and the Owner's Insurance Underwriter; all applicable sections of the National Fire Codes and the Codes and Standards of the National Fire Protection Association.

C. If code or other requirements exceed the provisions shown on the Contract Documents, the Architect shall be notified in writing. Where requirements of the Contract Documents exceed Code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.06 EQUIPMENT, MATERIALS, BID BASIS

A. Manufacturers' names, model numbers, etc. as specified on the Drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.

B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in the Specifications or on the Drawings as "base" products.

C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be substantially equal in size, weight, construction quality and capacities. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question.

D. The Contractor shall coordinate the installation of all fire protection equipment proposed for use in this project with all building trades (architectural, structural and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at no additional cost.

1.07 PAINTING

A. All piping exposed to public sight such as standpipe and drain piping in stairwells, or exposed to exterior or moisture conditions such as piping in parking decks, shall be primed and painted with two coats of an enamel-based paint. The color shall be as directed by the Architect.

B. Contractor shall touch-up to match original finish any equipment scratched in shipment or installation.

1.08 TRANSPORTATION, DELIVERY, STORAGE AND PROTECTION

A. The Contractor shall provide and pay for all transportation, delivery, and storage required for all equipment and materials. Upon receipt of all equipment and materials, they shall be properly stored in their original shipping container to protect them from vandalism, theft, the

elements, and other harm or damage. Any equipment or materials received in a damaged condition, or damaged after receipt, shall not be installed. Only new undamaged equipment in first-class operating condition shall be installed.

B. All equipment and piping shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.

C. The Contractor shall closely coordinate the ordering and delivery of all mechanical equipment with other trades to assure that equipment will be delivered in time to be installed in the building without requiring special or temporary access or building modifications. Certain equipment may have to be installed prior to the erection of the building walls or roofs.

1.09 GUARANTY

A. All fire protection work described in the Contract Documents shall be guaranteed for a period of one (1) year from the date of final acceptance. This guaranty shall apply to all equipment, materials and workmanship. During the guaranty period, all defects shall be corrected in an acceptable manner, consistent with the quality of materials and workmanship of original construction, at no expense to the Owner.

1.10 SHOP DRAWINGS

A. It is the responsibility of the Contractor to coordinate the design with the work of all other disciplines so as to avoid conflicts. Where necessary piping shall be offset around ducts, structural members or other obstructions, while maintaining effective coverage, drains shall be provided per NFPA requirements.

B. Review of the Drawings and hydraulic calculations by Jordan & Skala Engineers, Inc. (JSE) is for coordination with the design concept for the project, and for assurance that they have been prepared in a timely manner. JSE is entitled to rely on the technical sufficiency and timely delivery of these documents, as well as on the computations performed by the subcontractor. JSE shall not be required to review or verify those computations or designs for compliance with applicable laws, statutes, ordinances, building codes, and rules and regulations.

C. All required submittal data other than fire protection shop drawings shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review unless previously agreed to by the Engineer.

D. All fire protection drawing submittals shall be at 1/8" scale as a minimum. All submittals shall be in multiple sets for review by Architect, Owner, Contractor and Engineer.

E. The Contractor shall provide an itemized listing which indicates the horsepower and voltage of each piece of equipment that requires electrical service. The itemized list is to be located at the front of the bound submittal and is to be signed by the project managers of the Contractor, Electrical Contractor and General Contractor to ensure coordination of the electrical requirements for the project. Review of the equipment submittal will not begin until the electrical coordination document is provided.

F. Fire Protection shop drawings shall include all data required by NFPA Section 13. Shop drawing plans shall indicate all lights, grilles, soffits, alarms, speakers and other ceiling components, as well as hydraulic node points, to ensure coordination. The Contractor shall submit shop drawings to and secure approval of the Owner's Underwriter, local authority and/or state authorities prior to submission to the Engineer. The Contractor shall not commence work, purchase, or provide any materials to the job site without obtaining shop drawing approval. Shop drawings shall include copies of all hydraulic calculations providing design densities, where applicable. In addition, shop drawings submittals shall include printed catalog specifications and data sheets for all of the following as applicable:
   1. Fire department valves
   2. Sprinkler heads and accessories
   3. Siamese Fire Department connection
   4. Backflow preventer

G. A letter signed by an officer of the Contractor's company shall be included in the submittal book that states the following items meet or exceed the requirements of the specifications:
   1. Pipe and fittings
   2. Valves
   3. Pipe supports
   4. Pipe accessories
   5. Pipe labels and valve tags
   6. Flow switches
   7. Tamper switches

H. All design drawings and calculations prepared by the Contractor shall bear the seal of a registered professional or fire protection engineer or NICET Level IV certification licensed in the state of the project or equivalent fire sprinkler contractor's certificate seal.

I. Included with submittals of fire equipment requiring electrical connections shall be a written statement confirming coordination of voltage requirements, bearing the names and signatures of the fire and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the electrical drawings, as well as with the electrical contractor.

Fire Protection Contractor:_____

Project Manager Name:_____

Project Manager Signature/Date:_____

Electrical Contractor:_____

Project Manager Name:_____

Project Manager Signature/Date:_____

1.11 RECORD DRAWINGS

A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. Prior to final acceptance by the Owner, the Contractor shall assemble the complete set of as-built drawings that accurately reflects all changes to indicate actual final construction. All concealed piping shall be dimensionally located from at least two (2) column lines or major building structure elements. Drawings shall be a minimum of 1/8" scale.

1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to final acceptance by the Owner, the Contractor shall provide three (3) copies of an Operations and Maintenance Manual, Bound, indexed, and titled in three-ring, loose-leaf binders. These manuals shall each contain the following:
   1. Clear and concise instructions for operation, maintenance, adjustment, lubrication, wiring diagrams and trouble-shooting data for all mechanical equipment. This information shall be prepared by the manufacturer for particular size and model of equipment furnished.
   2. Parts list of all parts for equipment, with catalog numbers and other data necessary for ordering of replacement parts.
   3. Provide a competent manufacturer's service engineer for a minimum of two (2) days to instruct the operating personnel including the interpretation of all equipment diagrams. A diary of the training sessions shall be made by the instructing manufacturer's service engineer and witnessed by the Owner's representative and shall be included in the as-built submittal.
   4. Copies of all approved equipment shop drawings, sprinkler layout drawings, hydraulic calculations and as-built plans shall be submitted with the Operation and Maintenance manual.
   5. Index shall include type of equipment, manufacturer, and local representative with address and phone number.

PART 2 - PRODUCTS

2.01 FIRE PROTECTION SYSTEM MATERIALS

A. All materials, pipe, valves and equipment furnished under this section shall be new and approved by NFPA, Underwriters Laboratories Inc. (UL), Factory Mutual (FM) and American Water Works Association (AWWA) where applicable.

B. The proposal submitted shall include all materials and equipment as specified or shown on the Drawings. Proposed substitutions with difference in price, if any, shall be listed separately on the bid form at the time of submittal.

C. Required materials not covered by the detailed specifications shall be of a suitable class, grade and type and shall be subject to the approval of the Engineer. Where two or more units of the same class or type of equipment are required, these units shall be the products of a single manufacturer.

2.02 PIPE, JOINTS AND FITTINGS

A. Underground Piping
   1. Class 50 and 51 ductile iron pipe, bituminous coated outside, cement lined interior, ANSI A21.51 and A21.4
      a. Push-on or mechanical joints with neoprene gasket, 250 psi rating, ANSI A21.11
      b. Ductile iron mechanical joint fittings with neoprene gasket, bituminous coated outside, cement lined interior, 250 psi rating, ANSI A21.10
      c. Ductile iron flanged joints for all piping in vaults, red rubber gaskets, 250 psi rating, ANSI A21.15. Cadmium plated heavy hex machine bolts and nuts with bituminous coating field applied.
   2. Class 150 polyvinyl chloride (PVC) DR 18 pressure pipe, NSF and Factory Mutual approved, AWWA C900
      a. Push-on or mechanical joints with neoprene gasket, ASTM D3139 and ANSI A21.11
      b. Ductile iron mechanical joint fittings with neoprene gasket, bituminous coated outside, cement lined interior, 250 psi rating, ANSI A21.10
      c. Ductile iron flanged joints for all piping in vaults, red rubber gaskets, 250 psi rating, ANSI A21.15. Cadmium plated heavy hex machine bolts and nuts with bituminous coating field applied.
   3. Underground piping and installation shall be in accordance with the Insurance Underwriter's requirements and NFPA-24 and shall be installed with a minimum of 2'-6" of cover.
      a. Trenching conditions for ductile iron pipe shall be Type 1 laying condition, ANSI A21.50.
      b. Trenching conditions for PVC pipe shall be Class C bedding, ASCE Manual #37, and manufacturer's recommendations.

B. Aboveground Piping
   1. Schedule 40 welded or seamless steel pipe, ASTM A53 and A135.
      a. Class 125 and 250 cast iron threaded fittings, ANSI B16.4
      b. Class 150 and 300 malleable iron threaded fittings, ANSI B16.3
      c. Class 125 and 250 cast iron flanged fittings, ANSI B16.1
      d. Schedule 40, 150 psi, forged steel buttweld fittings, ANSI B16.9
      e. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, UL Listed, FM Approved
   2. Schedule 10 minimum lightwall welded or seamless steel pipe with corrosion resistant coating, CRR Value of 1 minimum, ASTM A53 and A135
      a. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, UL Listed, FM Approved
      b. Lightwall, 150 psi, buttweld fittings, ANSI B16.9
   3. Dry Systems
      a. Schedule 40 welded or seamless internally and externally galvanized steel pipe, ASTM A53 and A135.
      b. Class 150 and 300 internally and externally galvanized malleable iron threaded fittings, ANSI B.16.3
      c. Grooved mechanical couplings and fittings with EPDM flush gap gasket, galvanized malleable iron or ductile iron, 800 psi minimum rating, ASTM A47 and A536, UL Listed, FM Approved
      d. Provide chromium plated zinc or other approved corrosion prohibitant at all non-galvanized pipe threads, bolts and other areas to maintain the integrity of the galvanized system.

C. All interior sprinkler piping shall meet the requirements of applicable sections of NFPA, and the Owner's Underwriter. All pipe, fittings, valves, and sprinkler system components shall be rated for working pressures as required by system design.

D. All pipe, supports and hanger assemblies shall be in accordance with NFPA-13 and shall be UL Listed or FM Approved.

E. All sprinkler hangers and support rods installed in areas exposed to exterior conditions, including parking decks, are to be fully galvanized or painted with two coats of Adsil Microguard corrosion prohibitor.

2.03 VALVES AND ACCESSORIES

A. Valves shall be installed where shown on the Drawings and elsewhere as required by codes or standards. All valves shall be UL Listed or FM Approved for fire protection service. All valves shall be provided with remote alarm tamper switches compatible with the Owner's central alarm system to monitor valve tampering. All switches and systems shall be Class B supervised. Provide 250 and 300 psi rated components at all locations as required by system pressure.
   1. Gate Valves
      a. 2-1/2" and larger, Class 175 or 300, iron body, bronze mounted, solid wedge, outside screw and yoke, flanged ends, Stockham G-634 or F-670, listed for fire service
      b. 2" and smaller, Class 175, bronze body and trim, solid wedge, outside screw and yoke, threaded ends, Stockham B-133
   2. Butterfly Valves
      a. 4" and larger, Class 175, iron body, aluminum bronze disc, wafer or lug style, EPDM gasket, Stockham LG-52U
      b. 2" and smaller, Class 175, bronze body, stainless steel disc threaded ends, Milwaukee BB-FP
   3. Check Valves
      a. 2-1/2" and larger, Class 125, iron body, bronze trim, flanged ends, Milwaukee 1800 series, flanged, UL Listed for fire service
      b. 4" and larger, Mission fig. U-12 HMP, wafer body, UL Listed for fire service
   4. Backflow Preventers
      a. Double check assembly shall be a complete assembly with two (2) independently operating check valves mounted in a common body, two (2) gate valves and four (4) test cocks, designed for horizontal installation. All valves shall be provided with tamper switches. The complete assembly shall be UL Listed, FM Approved, designed to specifications and/or requirements of USC, CCCL, AWWA and ASSE and shall be sized for the full fire flow demand at a maximum of 6 psi pressure drop.
         1) Double check backflow preventer shall be Ames Maxim 200 Series, Watts No. 709, Hersey No. 2 or approved equal.
         2) Double detector check backflow preventers shall be provided where required by local authorities; assembly shall be Ames Maxim 300 Series, Watts No. 770, Hersey Model DDC II or approved equal.
   5. Siamese Fire Department Connection
      a. Fire department connection shall be 2-way exposed Siamese type, 2-1/2" x 2-1/2" x 4" size, cast brass body, polished chrome finish for all exposed surfaces, cast brass escutcheon, and brass female hose inlets having individual clapper valves, plugs, and chains.

Assembly shall be located with the center line of the hose inlets at 2'-6" above adjacent grade. Inlet threading shall be National Standard or same as municipal fire department, as required. Assembly shall be UL Listed, FM Approved. Wall Mounted: Potter Roemer 5710 series or approved equal.

b. Free Standing: Potter Roemer 5760 series or approved equal.

2.04 TESTS AND DRAINS

A. The Contractor shall provide test connections as required and as indicated on the Drawings. Inspector's test connections shall be fitted with sight glasses and the discharge of the drain riser shall be terminated above an adjacent hub drain with an air gap fitting. All tests shall have approved sight test assemblies as required by NFPA.

2.05 DRY SPRINKLER SYSTEMS

A. The Contractor shall furnish and install all specialty valves, pipe and equipment as required for the systems. The systems shall be complete with dry pipe valve, air compressor, accelerator, maintenance pressure compressor and associated trim and wired for interconnection to all required accessories, heat/smoke detectors, pressure switches, etc. as required.

B. Pad-mounted storage tank/air compressors assemblies and riser-mounted air compressors shall be sized, furnished and installed as an integral part of the dry pipe sprinkler system and shall meet all requirements of NFPA.

C. Should wet pipe systems in non-heated spaces be substituted for dry sprinkler systems as designed, the contractor is responsible for adding heat tracing, including all required electrical, insulation, supervision, etc. Substitutions or alterations to the original design shall be clearly stated on shop drawing submittals.

2.06 ELECTRIC MOTORS AND RELAYS

A. Design, type and ratings of electric motors shall comply with the National Electrical Code, NEMA and Underwriters Laboratories Inc.

B. Unless otherwise noted, or required for special applications, motors shall be equipped with sealed ball bearings.

C. All motors to be mounted on equipment supplied under this section shall be as manufactured by General Electric, Westinghouse, or Louis Allis.

2.07 PIPING AND EQUIPMENT IDENTIFICATION

A. A marker showing the service and an arrow indicating the direction of flow shall be applied on the following equipment installed under this section of the Specifications:
   1. All above ground fire protection standpipe and sprinkler piping
   2. All above ground sprinkler drainage piping

B. Piping identification shall be applied in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each valve, wall and floor

penetrations (both sides) and at connections to equipment. In addition, straight runs of piping shall be labeled at intervals not greater than 25 feet.

C. Equipment and component parts thereof shall bear manufacturer's nameplate, giving manufacturer's name, size, type model number or serial number, and electrical characteristics, to facilitate maintenance and replacements. Nameplates of distributors or subcontractors are not acceptable. Electrical equipment shall be UL Listed as applicable.

D. The letter size and background color shall conform to the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W.H. Brady Company, or Westline Products.

E. All valves shall have a 1-1/2" diameter laminate plastic tag, engraved, black and white marking and a brass hook for attaching to valve stem. Tags shall have letters as large as practical, the number of the valve and the service such as indicated on the "Legend." The numbers of service shall be consecutive. Tags shall be similar to Seton 2961.

F. All valves on pumps shall be similar to the valve tags specified above, except they shall be 2-1/2" in diameter, black with white number 2" high for attaching to valve stem by means of brass hook or small solid link brass chain. Tags shall be similar to Seton 2961-25.

G. These numbers shall correspond with numbers indicated for valves and controls on two printed detailed lists and locational diagrams. These printed lists and locational diagrams shall state the numbers and locations of each valve and control and the section which it controls.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Drawings are diagrammatic and the final arrangement of the work shall suit field conditions, the characteristics of the materials used and coordination with all other disciplines and the building components and finishes. Verify all dimensions in the field. Access and clearances must be provided and maintained for the proper operation, maintenance service and repair of the work.

B. No sprinklers are to be installed prior to the building being completely sealed in from external moisture and conditions.

C. All standpipe, sprinkler and drain piping exposed to sight in stairwells is to be painted with two coats of an epoxy based paint, color to be selected by the Architect.

D. All equipment and materials shall be installed according to manufacturer's recommendations and shall meet the requirements of NFPA and the Owner's Insurance Underwriter.

E. All sprinklers in spaces visible to public view shall be located symmetrically in relation to ceiling design elements, lighting fixtures, speakers, diffusers, etc. All ceiling components are to be indicated on the submittal drawings as noted previously to ensure coordination with all ceiling elements and devices. Piping to sprinklers in these areas is to be provided with arm-overs or flexible sprinkler drops to allow for exact placement of sprinklers.

F. Sprinklers shall be installed at the centerpoint of all 2' x 2' lay-in ceiling tiles, and at the centerpoint or 1' from the ends of 4' x 2' ceiling tiles.

G. Where pipe is installed above suspended ceilings, it shall be located in the clear space above the suspended ceiling and the pendent sprinklers shall be located to clear the ceiling supporting grid system, the ceiling mounted fixtures, and air conditioning ducts and outlets.

H. The Contractor shall install additional pendent sprinkler heads under all ductwork or other obstructions which are over 48" wide in accordance with NFPA-13 in areas of exposed construction.

I. All sprinklers located in areas that are to be painted shall be protected prior to painting.

J. **All sprinkler heads shall be the concealed type unless noted otherwise or not allowed by code.**

3.02 PREPARATION

A. Arrangements shall be made to have the openings, inserts, sleeves, blockouts, and such other incidentals set in place ahead of the construction work, where practical, to eliminate the need of cutting and patching. If coring becomes necessary for installation of the work, it shall be done under this section. All holes shall be neatly patched and finished to match the adjoining work in a manner approved by the Architect. All coring shall be performed in a manner not to weaken the structural parts and the manner and method shall be submitted to the Structural Engineer for approval.

3.03 SLEEVES AND ESCUTCHEONS

A. The Contractor shall furnish and set pipe sleeves and inserts for all work under this section and shall be responsible for their proper and permanent location. In the event that failure to do so requires cutting and patching, the remedial work shall be the responsibility of the Contractor.

B. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter 1-1/2" (3/4" annular space) larger than the outside diameter of the pipe or insulation on covered lines, except as otherwise specified herein.

C. Sleeves for all pipes through walls, beams and partitions shall finish flush with the finish line of the walls, beams and partitions.

D. Sleeves for all piping shall extend 1/2" above finish floor, (except where under partitions, the sleeves shall be flush with the bottom of the partition) and after the installation of pipe shall be packed and made watertight with fire stopping sealant to maintain separations and fire ratings.

E. Where pipes pass under footings and through exterior walls, sleeves shall be of galvanized steel pipe and shall be not less than 4" larger than the pipe being sleeved. Sleeves shall be made watertight where passing through waterproofed surfaces, exterior wall, and floor slabs on grade. Waterproofing shall be done by means of a steel slip on welding flange, continuously welded at the center of the sleeve and shall be painted with one coat of bitumastic paint inside and outside. The space between sleeve and pipe shall be packed with

oakum to within 2" of each face of the wall; (to within 2" of the top of sleeve at floors). The remaining space shall be packed and made watertight with a waterproof mastic. Mechanical expansion type rubber seals such as manufactured by Calpico Ind. and Thunderline Corporation are acceptable as alternate method of water proofing piping penetrations.

F. Sleeves through floors or interior masonry walls shall be of galvanized steel pipe or wrought iron pipe size except where located in concealed pipe spaces where they may be of 22 gauge galvanized sheet steel if fire rating is maintained.

G. Sleeves through interior masonry partitions shall be of 22-gauge galvanized sheet steel.

H. Sleeves for piping to receive insulation shall be large enough to allow continuous insulation through sleeves.

I. Spacing between or location of pipe sleeves in floor slabs, structural beams or structural walls shall be subject to the Structural Engineer’s approval.

J. Where pipes pass under load bearing footings they shall pass through a coated steel pipe sleeve as described above and extend past a 45 degree line out from the bottom of the load bearing structure. Concrete shall be used as backfill in the portions of trench within the 45 degree pressure line.

K. Escutcheons shall be provided around all exposed pipe passing through walls, partitions, ceilings and floors in finished spaces. Escutcheons shall be of sufficient outside diameter to cover the sleeve opening and shall fit snugly around the insulated or bare pipe and to the wall, partition, floor or ceiling.

3.04 WORKMANSHIP

A. All work shall be coordinated with the work to be performed or installed under other sections of these Specifications.

B. All work shall be executed in a workmanlike manner by workmen skilled in this type of work and shall present a neat appearance when completed.

C. Offsets shall be provided as required to avoid interference and conflicts with other work, to maximize headroom, or to improve the appearance of pipe runs. All pipe supports, structural members, hangers and other apparatus necessary to support firmly and substantially the various components of the systems shall be provided under this section.

D. Nameplates, catalog numbers and rating identifications shall be securely attached to equipment with screws or rivets. Adhesives or cements will not be permitted.

E. The subcontractor shall be responsible for the protection of the work from injury and shall protect all apparatus with suitable enclosures.

3.05 ERECTION AND INSTALLATION

A. Installation and workmanship requirements are specified hereinafter.

B. This subcontractor shall be responsible for the furnishing and installing of all support steel, hangers, rods, clamps, etc., to provide adequate support of all Fire Protection equipment specified herein. All support assemblies shall be UL Listed or FM Approved.

3.06 CLEANING OF SYSTEMS AND PREMISES

A. At all times, keep the premises clear of undue accumulation of rubbish.

B. On completion of the work, remove all rubbish and debris resulting from this Contract, and dispose of same.

C. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion. All equipment shall be partially or fully re-painted as required to provide an appearance of new equipment.

3.07 TESTS

A. Tests of all fire protection systems and equipment, underground and inside piping including alarm and detection devices shall be scheduled with one (1) week prior notification to a local representative of the Underwriter and the Architect. All tests and test procedures shall be in accordance with the applicable NFPA standards. After completion of all tests, the "Contractor's Materials and Test Certificate" shall be submitted to the Architect.

B. The Contractor shall supply all materials, labor, utilities and power required for testing. Preliminary tests shall be performed to prove work is satisfactory prior to requesting a test inspection. Sectional tests shall be made before insulation or concealing any piping.

C. Repair all defects disclosed by tests or, if required by the Architect, replace defective work with new systems and materials at no additional cost to the Owner. Repairs to piping systems shall be made with new material. No caulking of screwed joints, cracks or holes will be accepted. Make tests in stages to facilitate work of others.

D. The Contractor shall be responsible for the repair and/or replacement cost installed and finishes damaged by leaks, tests and/or repair and replacement of his work at no additional expense to the Owner.

E. Prior to final acceptance by the Owner, submit the "Contractor's Material and Test Certificates" indicating system compliance with all applicable sections of NFPA.

3.08 SUBCONTRACTOR'S WARRANTY

A. The Contractor shall warrant all equipment and the installation to function properly for a period of one year from date of final acceptance of the work.

B. Defects becoming apparent within the warranty period shall be repaired by the Contractor. In addition, all damages to installed work and finishes resulting from such defects shall be the responsibility of this Contractor either to repair or replace to equal the existing installation.

C. This warranty shall in no way obligate the Contractor to repair any and all damages resulting from accident or improper operation or care on the part of the Owner.

END OF SECTION 21 00 00

SECTION 22 00 00 - PLUMBING GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.

B. The scope of work described in these Specifications and/or indicated on the Drawings shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all systems. All work shall be accomplished by workmen skilled in the various trades involved.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the Engineer shall be notified of the discrepancy.

D. All work performed under this specification shall be accomplished in accordance with the requirements and provisions of Section 23 00 00 - HVAC General.

1.02 STANDARDS

A. All Plumbing systems shall conform to all ordinances and regulations of the City, County, State and/or other authorities having jurisdiction in accordance with the requirements of the following codes, standards and design guides.
   1. The International Plumbing Code, 2012 Edition, with Local Amendments.
   2. The International Building Code, 2012 Edition, with Local Amendments.
   3. The International Gas Code, 2012 Edition, with Local Amendments.
   4. International Energy Conservation Code, 2012 Edition, with Local Amendments.
   5. Americans with Disabilities Act (ADA)
   6. ANSI/NSF 61, NSF 372, and NSF 61-G compliance is required for all components of the domestic potable water system.
   7. American Society of Plumbing Engineers (ASPE) Data Books
   8. Plumbing Drainage Institute (PDI)
   9. Underwriters Laboratories Inc. (UL)
   10. National Sanitation Foundation (NSF)
   11. Local and State Fire Marshal requirements
   12. Local Building and Inspection Department requirements
   13. Local Health Department requirements

B. If code or other requirements exceed the provisions shown on the Contract Documents, the Engineer shall be notified in writing. Where requirements of the Contract Documents exceed code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.03 PERMITS

A. The Contractor shall obtain all permits and inspections required for the installation of this work and pay all charges incident thereto. He shall deliver to the Architect all certificates of said inspection.

1.04 WORK INCLUDED

A. Systems
   1. The Plumbing Systems installed and work performed under this Division of the Specifications shall include, but not necessarily be limited to, the following as noted below. The connection point for all systems from the site utilities shall be as 5'-0" from the exterior of the building unless specifically otherwise noted.
      a. Domestic cold, hot and hot water recirculation systems
      b. Sanitary, drainage, waste and vent systems
      c. Natural gas/propane gas system
      d. Grease waste and waste systems from food service areas

1.05 DRAWINGS

A. The Drawings are diagrammatic and do not necessarily depict exact conditions. The indicated locations of equipment, ductwork, piping, etc. are approximate only. The Drawings are schematic in nature and are not to be scaled. Scales are shown for reference and approximation only. Refer to the architectural drawings for dimensional data of building components.

B. The locations, arrangement and extent of equipment, devices, and other appurtenances related to the installation of work shown on the Drawings are approximate. The Contractor shall not scale drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy for resolution.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

1.06 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare a minimum of two (2) instruction manuals, one of which shall be submitted to the Architect for the Engineer's review, describing installation, operation and maintenance of all Plumbing equipment. Manuals shall include copies of control schematics, sequences of operations, indicate the function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturers' drawings, pamphlets, data, parts lists and instructions manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in a 3-ring binder(s).

B. The Contractor shall give detailed instructions for a period of not less than two (2) days to the responsible personnel designated by the Owner in the operation and maintenance of all equipment furnished under this Contract. A letter containing the name of the person or persons to whom the instructions were given and the dates of instruction period shall be submitted to the Engineer in the as-built submittal.

C. Prior to final acceptance by the Owner, the Contractor shall submit a complete as-built drawing submittal for the Engineer's review, three (3) sets of operating and maintenance manuals, spare parts lists, drawings, wiring diagrams, troubleshooting data, manufacturer's bulletins, and other pertinent data on all equipment furnished under this Contract. Each set shall be enclosed in a suitable hard cover binder.

D. A complete set of reproducible as-built drawings shall be provided indicating the location of all piping dimensionally located from a minimum of two column lines or major building structures. Drawings shall be a minimum of 1/8" scale.

E. Provide name, address and telephone numbers of the manufacturer's representative and service company for each piece of equipment installed in the as-built submittal package.

F. Provide all loose keys for supply valves, wall hydrants and hose bibbs installed.

1.07 RECORD DRAWINGS

A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. After all work is completed, the Contractor shall prepare a set of "record" reproducible drawings of similar type and quality as the Contract Drawings that reflect all changes and that accurately show actual final construction, and deliver these drawings to the Architect.

1.08 EQUIPMENT, MATERIAL BID BASIS

A. Manufacturers' names, model numbers, etc. as specified on the Drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.

B. Alternate "approved equal" items listed shall conform to specified base items and shall be substantially equal in quality, size, weight, construction, capacities and performance. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. The Engineer shall consider the use of the alternate equipment based on the supportive documentation and other information available to him, and shall approve or disapprove any alternates. The decision of the Engineer shall in all cases be final.

C. The Contractor shall coordinate the installation of all plumbing equipment proposed for use in this project with all building trades (architectural, structural, mechanical and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at no additional cost. When substitution of equipment is made, the Contractor shall be responsible for the costs of any

item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.09 SUBMITTALS

A. The Contractor shall prepare, submit, and obtain Engineer's review of manufacturers' submittals on the following equipment and systems prior to ordering, purchasing, or installation of any equipment or materials. All required submittals shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review.
   1. Plumbing fixtures, faucets and trim
   2. Water heaters
   3. Insulation
   4. Floor drains and drainage accessories
   5. Hydrants and hose bibbs
   6. Mixing valves
   7. Hot water return pumps
   8. Backflow preventers
   9. Grease/oil interceptors
   10. Pipe and fittings
   11. Valves
   12. Pipe supports
   13. Piping accessories
   14. Pipe labels and valve tags

B. All approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to equipment being submitted to the Engineer.

C. Review of submittals by the Engineer does not relieve the Contractor from the responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements of all approved equipment with other trades and disciplines such as roof openings, wall openings, electrical characteristics, etc.

D. All submittals shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.

E. Submittals shall clearly indicate selection of model numbers, sizes, dimensions, electrical characteristics, etc. of the proposed equipment. Any proposed deviations from specified equipment shall be clearly indicated on the submittal.

F. Included with submittals of plumbing equipment requiring electrical connections shall be a written statement confirming coordination of voltage requirements, bearing the names and signatures of the plumbing and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the Electrical Drawings, as well as with the electrical contractor.

Plumbing Contractor:_____

Project Manager Name:_____

Project Manager Signature/Date:_____

Electrical Contractor:_____

Project Manager Name:_____

Project Manager Signature/Date:_____

1.10 COORDINATION OF TRADES

A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

B. Piping and other plumbing equipment shall not be installed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated piping and other plumbing equipment installed should they interfere with the proper installation and mounting of electrical, HVAC equipment, ceilings and other architectural or structural finishes.

C. The Contractor shall coordinate the elevations of all piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.

D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.

E. The Contractor shall confirm that work installed under this section does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.

F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.

G. All offsets, fittings, valves, devices and accessories which may be required are to be provided under this Contract. The Contractor shall examine the entire set of Contract Documents and carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly for the complete satisfactory operation of all systems, providing such fittings, traps, valves, devices and accessories as may be required to meet such conditions.

1.11 WARRANTY

A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.

B. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Contract Documents shall be suitable for the intended use and shall be subject to approval by the Engineer.

B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.

C. All equipment shall bear the inspection label of Underwriters Laboratories Inc.

D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.

2.02 ELECTRICAL WORK

A. Except as otherwise specified or noted, electrical equipment used for plumbing systems shall be as specified herein.

B. Motor controls, system controls, starters, disconnects, pilot lights, push buttons, etc. shall be furnished by the Contractor compatible with the apparatus that it operates. Electrical equipment shall be wired for the voltage, as shown on the Electrical Drawings.

C. The Contractor shall be responsible for coordinating and furnishing equipment of voltage shown on the electrical documents.

D. Electric motors shall be high efficiency, open drip-proof type unless otherwise specified. Motors shall be standard NEMA continuous duty type and shall bear the UL Label. Motors shall be selected with a minimum of 15% safety factory greater than the fan brake/horsepower (e.g. 4.75BHP would require a nominal 7-1/2 HP motor). The motor service factor shall not be used as part of the safety factor. All motors shall have thermal overload protection. Motors shall meet Table MG-1-12C of EPACT 1992.

E. Motors controlled by a variable frequency drive (VFD) shall be inverter duty rated and fully compatible with the VFD provided.

F. Starters for motors 1/3 HP and smaller shall be manual type, and for 1/2 HP and larger, shall be magnetic type. Starters shall be minimum size 0, combination type (with disconnect and lockable handle) with molded case circuit breaker. Starters for motors with remote or

automatic control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.

G. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type unless otherwise indicated on the Drawings or specified herein.

H. Motor controls shall be either "Hand-Off-Auto" switches or "On-Off" push buttons with one indicating light. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.

I. Motor starters that are not an integral part of equipment shall be installed in conformance with Division 26 - Electrical Requirements.

J. Electrical power wiring to disconnects, starters, and equipment shall be provided and installed by Division 26. All equipment requiring electrical power shall be provided with disconnect switches at each piece of equipment. Coordinate switch type (fused or non-fused) with equipment characteristics, manufacturer's recommendations and Electrical Drawings.

K. The Contractor shall provide all system controls, control and interlock wiring 120 volts and less in conduits in accordance with materials and installation requirements of Electrical Section. All starters shall be labeled on face of starter.

L. All starters for 3-phase equipment shall have overload devices in all three (3) phases.

M. Wiring diagrams shall be furnished by the Contractor.

N. Acceptable manufacturers shall be General Electric, Square D, Cutler-Hammer, Siemens and Allen Bradley.

2.03 PIPING SYSTEMS

A. General
   1. The various piping systems are classified as follows, and materials of construction shall be as specified unless otherwise noted on the Drawings.
   2. Piping, valves and equipment used in similar applications shall be provided from the same manufacturer unless noted otherwise.

B. Domestic Cold Water System, Underground, 3 Inches and Larger, Suitable for Working Pressure of 125 psig to 5'-0" Outside Building
   1. Pipe
      a. Ductile iron thickness Class 51 for 3 inch and 4 inch size thickness, Class 50 for 6 inches and larger, ANSI A21.51, ASTM A746 with bituminous coating outside and cement mortar lining inside. Ductile iron mechanical or push-on joints and fittings ANSI/AWWA C110/A21.10.
      b. Mains where pressure is no greater than 100 psi: Polyvinyl Chloride (PVC), 160 psi water piping, ASTM D2241, SDR26 with mechanical or push-on joints with neoprene "O" rings, ASTM D3139.
      c. Mains where pressure is greater than 100 psi: Polyvinyl chloride (PVC), 200 psi water piping, AWWA C900, 200 psi, with mechanical or push-on joints with neoprene "O" rings, ASTM D3139.

d. Polypropylene piping, SDR 7.4 minimum, ASTM F2389, electro-fusion welded joints and fittings, ASTM F2389, NSF certified

2. Fittings: All valves, fittings, and changes in direction or elevation shall have joints restrained in accordance with NFPA-24.
3. Joints: All joints shall be mechanical or push-on per ANSI A21.11.
4. Trenching Conditions: Class B1 bedding with 4" minimum thickness of clean granular fill. Recesses shall be provided at all pipe barrels to ensure no loads are transmitted at the joint connections.

C. Domestic Water System Branch Piping, Underground, 2 Inches and Smaller, Suitable for a Working Pressure of 125 psig
1. Pipe:
   a. Copper Type K, soft annealed, conforming to Federal Specification WWT-799.
2. Fittings
   a. Fittings are not permitted below floor slabs with copper Type K soft annealed pipe.
3. Joints
   a. Joints are not permitted below floor slabs with copper Type K, soft annealed pipe.

D. Domestic cold water and hot water systems above ground, 4 inches and smaller, suitable for a minimum working pressure of 200 psig at 200 degrees F.
1. Pipe:
   a. Type "L" hard drawn copper tubing per ASTM B-88 and Federal Specification WWT-799.
2. Fittings
   a. Solder or brazed joint copper fittings per B16.18 or 16.22.
   b. Grooved copper fittings with full flow radius elbows, ASTM B-75, ASTM B-584, Victaulic CTS system, or Engineer approved equal.
   c. Copper pressed fittings with radius elbows, crimped connections and EPDM O-rings, ASTM B-88, 200 psi rating, Ridgid Viega ProPress and ProPress XL systems.
3. Joints
   a. Soldered with lead-free solder, J. W. Harris "Bridgit" or equal.
   b. Brazed joints with lead-free brazing filler materials and compatible alloys.
   c. Ductile iron mechanical couplings with bolted connection for grooved piping, ASTM A-536, with EPDM copper tube size gaskets, rated working pressure 300 psi.
   d. Solvent cement and primer for CPVC piping, ASTM F-493.

E. Sanitary, waste and vent and storm drain systems, below ground to 5'-0" outside building.
1. Pipe
   a. Service weight hub and spigot cast iron soil pipe per ASTM A-74, coated on outside.
   b. Schedule 40 DWV PVC pipe, ASTM 1785. Install per ASTM D 2321.
   c. PVC piping is not acceptable for waste piping receiving waste discharge higher than 130 degrees F, such as from laundry and kitchen equipment.
2. Fittings
   a. Service weight hub and spigot cast iron soil pipe fittings per ASTM-A-74, coated on outside.
   b. Schedule 40 DWV PVC, socket type fittings, ASTM 2665.
3. Joints
   a. Neoprene gasketed joints per ASTM C564.
   b. Cast iron mechanical couplings with neoprene gaskets and stainless steel nuts and bolts, ASTM A 48/A 48M or ASTM Standard C-1540. Heavy duty type 304 stainless steel shielded couplings. Acceptable manufacturers: Husky SD 4000 or Clamp-All 125.

c. Solvent joints for PVC, ASTM D-2564.

F. Sanitary waste and vent system above ground.
1. Pipe
a. No-hub cast iron soil pipe per CISPI 301 and ASTM A888.
b. Type DWV copper tube per ASTM B-306 and ANSI H-23.6.
c. Polyvinyl Chloride (PVC), schedule 40 DWV PVC pipe, ASTM 1785.
d. PVC piping is not acceptable in plenum ceilings or for waste piping receiving waste discharge higher than 130 degrees F, such as from laundry and kitchen equipment.
2. Fittings
a. No-hub cast iron fittings per CISPI 301 and ASTM A888.
b. DWV solder joint fittings per ANSI B16.29 or B16.23.
c. Schedule 40 DWV PVC, socket type fittings, ASTM 2665.
d. Urinal connections shall be iron pipe size brass with brass screwed fittings.
3. Joints
a. Joints for no-hub pipe and fittings shall be per CISPI 310, with stainless steel clamps and neoprene sleeve conforming to ASTM D 564.
b. Heavy duty joints for no-hub pipe and fittings shall conform to the requirements of ASTM Standard C-1540 and shall be heavy duty type 304 stainless steel shielded couplings. Acceptable manufacturers: Husky SD 4000 or Clamp-All 125.
c. Heavy duty, shielded, cast iron couplings: ASTM A 48/A 48M, two-piece, cast iron housing, stainless steel bolts and nuts; and ASTM C 564, rubber sleeve,. MG coupling.
d. All solder joints shall be made with a solder consisting of 95% tin and 5% antimony.
e. Solvent joints for PVC, ASTM D-2564.

G. Compressed Air Piping
1. Piping Systems
a. Schedule 40, ASTM A-53, galvanized steel pipe. Fittings: Galvanized malleable iron, class 150, threaded. Schedule 40 galvanized forged steel, threaded. Valves: Ball valves or gate valves, class 150, threaded ends.
b. For pipe sizes 2" and smaller, the Vic-Press system for Schedule 10S pipe may be used in lieu of galvanized steel. The system shall be rated to 500-psi CWP, with grade HNBR or Nitrile gaskets.

H. Pumped discharge piping
1. Pipe
a. Schedule 40 seamless or welded galvanized steel pipe, ASTM A-53.
b. Type “L” hard drawn copper tubing per ASTM B-88 and Federal Specification WWT-799.
2. Fittings
a. Class 125 and 250, cast iron threaded fittings, ASTM A-126, ANSI B16.4.
b. Solder or brazed joint copper fittings per B16.18 or 16.22.

2.04 VALVES, FLANGES AND UNIONS

A. General
1. All systems under this section shall be provided with valves to permit complete and sectional control of the system. They shall be located to permit easy operation, replacement and repair. They shall be installed where shown on the Drawings, or as herein specified. Valves to comply with NSF 61-G, NSF 61, and NSF 372. Valves shall be as manufactured by one of the following companies: American, Kennedy, Kitz,

Milwaukee, Nibco, Powell, Stockham, Watts, or approved equal, and shall conform to description listed below.

B. Valve Description
   1. Gate Valves
      a. 2-1/2" and larger, Stockham G-634, 175 lb. flanged OS&Y.
      b. 2-1/2" and larger: Milwaukee Fig. F-2885, 125 lb., flanged or Milwaukee CW 223 Butterfly valve with 10 pos. lever handle.
      c. 8" and larger: Milwaukee CW 323 Butterfly valve with gear operator.
      d. 2-1/2" and smaller, Milwaukee No. BB-SC100, screwed.
   2. Check Valves
      a. 2" and smaller, Milwaukee UP509, 125 lb., screwed.
      b. 2-1/2" and larger, Milwaukee Fig. F-2974, 125 lb. flanged.
      c. 2-1/2" and larger, Stockham G-939, 175 lb. flange.
   3. Ball Valves
      a. 2" and smaller, Milwaukee UPBA 100.
   4. Backflow Preventers
      a. Backflow preventers shall be installed at all locations required by code and local authorities, at all connections to mechanical equipment, and elsewhere as shown on the Drawings. Backflow preventers shall be reduced pressure principle type and shall be a complete assembly including tight-closing shutoff valves before and after the device. The design shall include test cocks and a pressure-differential relief seating check valves. The device shall meet the requirements of and be certified by ASSE Standard 1013, AWWA Standard C-506, NSF 61-G, NSF 61, NSF 372, and USC Foundation for Cross-Connection Control. A strainer shall be located upstream of the device. Route relief outlet from cone receptor to an air gap fitting for discharge to sanitary sewer.
      b. Acceptable manufacturers are Ames Company, Apollo Valves, Hersey Products, Watts Regulator, and Zurn-Wilkins.
   5. Class II turbine type water meters shall be installed downstream of the backflow preventer, on the domestic water supply to HVAC equipment make-up, irrigation supply, and pool/fountain supply to allow for a reduction in sewer rate charges.
   6. Pressure Reducing Valves
      a. A duplex pressure reducing valve station shall be provided on all domestic water systems greater than 80 psi.
   7. Flanges
      a. All flanges shall be faced and drilled for not less than 125 pounds steam working pressure complete with necessary adapter, and shall be of size and material of adjacent piping. All flanges shall be faced (raised or flat) to be compatible with connecting valves, equipment, etc. The connection of one raised face flange to a flat face flange shall not be permitted.
   8. Unions and Joints
      a. Unions on drainage pipes on fixture side of traps may be slip or flanged joints with soft rubber washers or gaskets. Unions 2" and smaller on copper pipe shall be all brass with ground joint and shall be 250# copper to copper. Unions above 2" shall be flanged with gaskets. Provide union at water and gas connection to all equipment, except plumbing fixtures.
      b. Bathtub waste and overflow joints shall be soldered if required by local authorities to eliminate the requirement for an access panel to bathtub drain connection.

2.05 CLEANOUTS

A. Cleanouts shall be provided where indicated on Drawings and elsewhere as required by code.
   1. Cleanouts in pipelines shall consist of cast iron ferrule and heavy duty cleanout plug with square head as scheduled on the Drawings. Where piping is concealed in floors or walls cleanouts shall be installed in or near surface of walls and have countersunk plugs with covers.

B. Cleanouts shall be provided at the base of the stack on all sanitary, waste and drainage stacks.

C. Where such conditions occur in walls or partitions the cleanout cover shall be accessible through an opening left in the wall and covered with a flush chromium plated brass or stainless steel plate securely fastened in place.

D. Where test tees are installed at the base of the stack, or on the stack, they may be used as a cleanout.

E. Brass cleanouts shall be solid nut construction.

F. Provide Owner with three (3) wrenches for removing flush cleanout plugs.

2.06 FLOOR DRAINS

A. Setting Grades
   1. Before setting any drains, the plumbing contractor shall obtain exact elevation of finished grade at the top of the drains. Drains in excess of 1/4" below the adjacent finished floor shall be removed and reset to the correct elevation.

B. Drain Types
   1. All floor drain outlets shall be of size noted on the Drawings. All drains shall be equal to the assembly specified. Acceptable manufacturers are as follows: Josam Co., Zurn Co., J.R. Smith Co., Wade, or approved equal. Drains shall be acid-resisting where indicated.

C. Trap Primers
   1. Drains not receiving a continuous discharge are to be provided with an automatic trap primer.

2.07 ACCESS PANELS

A. Group valves together above suspended ceilings, walls, furred spaces to minimize the number of access panels, but with all valves freely accessible for maintenance. Locate all valves within 1'-0" of access point.

B. Furnish access panels of proper size to service concealed valves and cleanouts. Panels shall be of the proper type for material in which they occur and are to be furnished by the Contractor, but installed by the particular trade for the material within which the access panel is installed.

C. Panels shall have flush doors with No.14 USCG steel door and trim No. 16 USCG steel frame, metal wings for keying into construction, concealed hinges, and screwdriver operated stainless steel cam lock. Panels shall be shop coated with one coat of zinc chromate primer. Valves above removable ceilings shall have tile clips by the Contractor for identification.

D. Access panels are not allowed in gypsum ceilings in public spaces.

2.08 INSULATION

A. The following shall be insulated:
   1. All domestic cold water piping above grade except at horizontal chase branch piping to individual plumbing fixtures.
   2. All hot water and hot water return piping except at horizontal chase branch piping to individual plumbing fixtures.

B. Domestic hot, cold, hot water recirculation, primary storm drainage, and waste drainage piping shall be insulated with 4 lb. density sectional fiberglass insulation with a thermal conductivity not to exceed 0.24 with white all service jacket and vapor barrier. All joints and seams shall be sealed vapor tight. All seams and staples shall then be covered with "All Service Jacket" three-inch wide tape.

C. All interior horizontal storm drainage piping systems and roof drain bodies are to be insulated with blanket type glass fiber bonded with thermosetting resin with white vinyl vapor retarding facing, 2" wide stapling/taping tab.

D. Materials as specified in this section shall be manufactured by CertainTeed, Johns Manville, Knauf, Owens Corning or equal. Insulation thicknesses shall be as shown in the following table:

Minimum Pipe Insulation			**Insulation Thickness for Pipe Sizes**				
Piping System Types	Fluid Temperature Range		1 in. and Less	1-1/4 to 2 in.	2-1/2 to 4 in.	5 and 6 in.	8 in. and Larger
	°C	°F	In.	In.	In.	In.	In.
PLUMBING							
Domestic Water	Ambient	Ambient	0.5	1.0	1.0	1.0	–
Domestic Hot Water and Hot Water Recirculation	43-71	110-160	1.0	1.0	1.5	1.5	–
Above Grade Drains and Piping Receiving Condensate	4.5-15.5	40-60	0.5	1.0	1.0	1.5	–

2.09 PIPE SUPPORTS AND HANGERS

A. All piping shall be supported by means of hanger rods and pipe hangers from roof or floor structure using supplementary steel and/or lagbolts. Water supply pipe connecting to fixtures or fixture supplies shall be made rigid.
   1. Piping shall be supported from new concrete construction with Anvil International Fig. 282 inserts or drilled expansion anchors.
   2. Piping shall be supported from new steel construction with Anvil International Fig. 131 beam clamp, Fig. 61 beam clamp, Fig. 66 welded beam attachment or Fig. 60 washer plate with all-thread rod.
   3. Piping and brackets shall be supported from hollow block construction using drilled masonry holes and toggle bolts.

4. Piping shall be supported from wood truss construction with plated lag screws or bolts, B-3227 and B-3228.
5. Pipe supports shall not be attached to floor or roof deck.

B. Unless otherwise noted, hangers and clamps shall be as listed below (all model numbers are B-Line Systems):
1. Cast iron/steel pipe - B3100 or B3109.
2. Insulated water pipe - B3100 or B3109 with B3151 placed over insulation protection saddle.
3. Uninsulated bare copper pipe - B3170 CTC plastic coated.
4. All supports and mounting hardware are to be galvanized, cadmium plated, or factory enamel painted.
5. All supports on insulated piping systems shall be sized to fit outside the insulation and shall be provided with insulation inserts and shields at each hanger or support point.

C. Branch piping to fixtures in chases shall be supported with plastic or copper clamp type supports:
1. B-Line Ruffin series.
2. Holdrite Systems.

D. Maximum spacing between pipe hangers shall be:
1. Steel pipe
   a. 1-1/4" and smaller: 6'-0"
   b. 1-1/2" – 2": 8'-0"
   c. 2-1/2" and larger: 10'-0"
2. Cast iron soil pipe: 2" and larger: 10'-0"
3. Copper tubing:
   a. 1/2" – 1-1/4": 5'-0"
   b. 1-1/2" – 2": 8'-0"
   c. 2-1/2" and larger: 10'-0"
4. PVC/CPVC and all plastic pipe:
   a. 1-1/4" and smaller: 3'-0"
   b. 1-1/2" and larger: 4'-0"

E. At least one hanger shall occur within 2'-0" from where change in direction takes place. Where pipes extend down or up to other floors, pipe clamps shall be provided on each floor to support vertical risers.

F. Special approved hangers that require less installation space are to be used where required due to ceiling space limitations.

2.10 WATER HEATERS – ELECTRIC STORAGE TYPE

A. Provide electric storage type water heaters as specified on the Drawings. Water heaters shall have an efficiency factor greater than, or equal to 96%.

B. Water heater shall carry a UL certification for 150 psi working pressure, an ASME temperature and pressure relief valve (T and P) sized for the heater, vacuum relief valve, immersion thermostat, glass lined tank, temperature gauge on outlet, and manual reset high limit control.

C. Provide a 4" high concrete housekeeping pad at water heaters, pad is to be 3" larger than the footprint of the heater. Water heaters greater than 10 gallons shall be floor mounted.

D. Provide a combination ball/relief valve on the domestic water supply sized as indicated on the Drawings, Watts series LFBRV or approved equal.

E. Water heaters that are not supplied with integral heat traps and serving non-circulating systems shall be provided with heat traps on the supply and discharge piping associated with the equipment. A check valve and expansion tank can be utilized in lieu of the supply side heat trap.

F. The water heater shall carry a five-year minimum limited warranty for tank leakage.

G. Gas-fired water heaters shall be as manufactured by:
   1. Lochinvar
   2. Bradford White
   3. A.O. Smith

2.11 FLASHING

A. Vent pipes passing through roof shall be flashed watertight.

B. The roof connections shall meet the approval of the manufacturer of the roofing materials and shall comply with the roof bond requirements.

C. All vent piping shall be offset above ceilings or in attic space and as shown on the Drawings to penetrate roofs on the least visible sides of building.

2.12 FLOOR, WALL AND CEILING PLATES

A. Furnish and install heavy gauge chromium plated steel wall and ceiling plates on all exposed pipes in finished areas where they pass through walls, ceilings, etc. Plates shall be of type that will remain permanently in position and where pipes are insulated they shall be of size necessary to cover insulated pipe.

2.13 GALVANIC PROTECTION

A. Insulate joints between dissimilar metals with suitable isolation gasket and bolts with fiber ferrules and washers and/or suitable armored insulation fittings by Clearflow, Crane, Capital, or Epco, so there will be no contact between the metals or with insulating bushings.

2.14 PIPING SYSTEMS IDENTIFICATION

A. A marker showing the service and an arrow indicating the direction of flow shall be applied on all of the following piping systems applicable to the project installed under this section of the Specifications:
   1. Compressed air piping
   2. Domestic hot, cold and hot water recirculation water piping
   3. Gas piping
   4. Sanitary, waste and vent piping

B. Piping identification shall be applied on all piping systems in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each wall and floor penetration (both sides), and at connections to equipment. In addition, straight runs of piping shall be labeled at intervals not greater than 25 feet.

C. The letter size and background color shall conform to the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W. H. Brady Company, or Westline products.

D. Each valve in the Plumbing and Fire Protection systems is to be provided with an individually numbered valve tag.

E. Valve tags are to be brass or plastic laminate, 1-1/2" minimum diameter with brass chain and hook for securing to the valve.

F. Valve tags will include a “P” or “FP” lettering designation to indicate the appropriate system. Numbering shall be consecutive for each service of either the Plumbing or Fire Protection systems.

G. A printed list or schematic drawing shall be compiled for each system indicating the location and detailed description of the system or equipment served.

H. One copy of each list shall be framed and mounted at the location designated by the Building Engineer. An additional copy of each list is to be included in the Operations and Maintenance Manual.

2.15 EQUIPMENT LABELING

A. All equipment shall be labeled. This shall include all pumps, water heaters, storage tanks, and other similar equipment.

B. Equipment labeling shall be one of the following, unless noted or specified otherwise.
   1. Permanently attached plastic laminate signs with 1" high lettering.
   2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. All equipment and materials shall be completely installed, adjusted, and fully operational with all accessories and connections.

B. Equipment, piping, ductwork, etc. shall fit into the spaces provided in the building and shall be installed at such times and in such a manner as to avoid damage and as required by the job progress. The Contractor shall coordinate work with other trades and locate work described herein to avoid interferences with structural, electrical and architectural work. Equipment, accessories and similar items requiring normal servicing or maintenance shall be accessible.

C. The Engineer reserves the right to direct the removal of any item which, in his opinion, does not present an orderly and reasonably neat or workmanlike appearance. Such removal and

replacement shall be done when directed by the Engineer and without additional cost to the Owner.

D. Mounting heights, unless otherwise noted, are to the finished bottom of the device.

3.02 EXCAVATION, TRENCHING AND BACKFILLING

A. The Contractor shall perform all excavation to install the work herein specified and as indicated on the Drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor.
Grading shall be done to prevent surface water from flowing into trenches and others excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling or boring shall be done except under pavement.

B. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, and tamped in 12" layers. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.

C. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and tamped until the crown of the pipe is covered by a minimum of 6" of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned.
In instances where the manufacturer’s installation instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 95% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off. A metallic lined underground warning tape shall be provided 12" below finished grade. The tape shall be identified as to the type of line per ANSI standard nomenclature and color.

D. Provide a layer of sand at least 6" deep under all plastic pipe installed in soil. Bell holes shall be excavated to ensure that the sewer pipe rests for its entire length upon a solid trench bottom.

E. Perform excavation and backfilling work in accordance with applicable portions of the earthwork section.

3.03 STORAGE AND PROTECTION OF MATERIALS

A. During construction, all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers, etc.

B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, test plugs until final connection to system is made.

C. All equipment and piping shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.

D. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in manner to prevent damage to materials during storage and handling. Replace damaged materials.

E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.04 CUTTING AND PATCHING

A. Work shall include all cutting, patching, masonry and carpentry required as part of the equipment installation when not provided by other sections of these specifications.

B. All work shall be performed as specified under architectural specification section for cutting and patching.

3.05 CONCRETE WORK

A. Construct curbs, pads, vaults and similar supports for equipment where required.

B. Provide 4" thick housekeeping pads at floor mounted equipment a minimum of 3" larger than the entire area occupied by equipment. Dowel pads to structural slab.

C. Perform concrete work in accordance with applicable portions of Concrete sections. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

3.06 CLEANING

A. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the job site.

B. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, etc. shall be thoroughly cleaned both inside and out.

C. After testing and balancing of systems as specified and just prior to Owner review and acceptance, all systems shall be finally cleaned and shall be left ready for use.

3.07 PAINTING

A. Painting, except as otherwise specified, will be done under another section of the specifications, but the Contractor shall leave all surfaces of work free of rust, dirt and grease.

B. The Contractor shall touch-up to match original finish any equipment scratched in shipment or installation. Touch-up painting of plumbing equipment shall be part of the plumbing work.

C. Provide one coat of rust preventive primer on all new structural steel supports and new ferrous surfaces which are not galvanized (this includes piping systems). Rust preventative painting shall be part of the plumbing work.

D. All painting and coating shall match the original and shall conform to the requirements detailed in other sections of these specifications. Do not paint over nameplates on equipment, nonferrous hardware, accessories or trim.

3.08 EQUIPMENT SUPPORT

A. Major equipment supports (framed structural openings, etc.) shall be furnished and installed by others as shown on the Drawings. The plumbing work shall include, the furnishings and installation of all miscellaneous equipment supports, structural members, rods, clamps and hangers required to provide adequate support of all equipment.

B. Unless otherwise shown on the Drawings, all equipment, piping, and accessories shall be installed level, square, and plumb.

C. All equipment, piping, etc. supported by structural joists shall be supported by the top chord only of such joists. Hangers shall not be attached to the bottom chord of any joists.

3.09 PIPE PENETRATIONS

A. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe penetrations. Sleeves for pipe shall be Schedule 40 black steel. Sleeves shall be sized to provide a minimum of 1/4" clearance between the sleeve and pipe.

B. As far as possible, all pipe penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.

C. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, escutcheon plates shall be chrome plated. All escutcheon plates shall be sized to completely conceal the penetration.

D. Pipe penetrations through exterior walls shall be sealed watertight with expandable link type seals by Thunderline, Linkseal or Engineer approved equal.

E. All pipe and duct penetrations of fire, smoke, or fire and smoke-rated assemblies shall be fire-stopped as required to retain the integrity of the UL rated assembly. Fire barrier products shall be as manufactured by Tremco, Hilti, 3M, Metacaulk, Nelson, or approved equal. Also, refer to Division 7 – Thermal and Moisture Protection.

3.10 FLASHING

A. All piping penetrating roofs shall be flashed in an approved manner, shall be watertight, and shall conform to the requirements detailed in other sections of these specifications.

B. Flashing for piping shall be sheet lead of not less than 6 pounds per square foot, shall have a base not less than 2 square feet, and shall extend up over and into the open end of the pipe. All flashing shall be properly caulked and sealed.

3.11 PIPING SYSTEMS

A. Water Piping - General
   1. Pipe used in piping assembly must be clean of dirt and obstructions and shall have ends square and reamed before putting into the fittings.
   2. All piping must be true and plumb with proper pitch for draining of the soldering.
   3. All domestic water lines serving flush valve fixtures and washing machines shall be protected from water hammer by shock absorbers. Where shock absorbers are required they shall be as manufactured by Josam Mfg. Company, J. R. Smith, Sioux Chief Ind., Precision Plumbing or Zurn Mfg. Co. and shall conform to the Plumbing and Drainage Institute published requirements.
   4. All connections to water heaters, tanks and equipment shall be made with unions or flanges. Insulated piping systems shall be installed to provide space for insulation.

B. Sanitary Waste, Vent, Indirect Waste and Storm Drain Piping - General
   1. Pipes shall be plumb and parallel to building walls, beams and columns unless otherwise indicated. All horizontal lines are to be evenly pitched and properly secured with iron or steel hangers, unless noted otherwise. A pitch of 1/4 inch per lineal foot shall be maintained on all soil, and waste lines, wherever possible. Where long runs of piping require less pitch due to space restrictions, a less pitch shall be allowed on main lines four (4) inches and over in size, but in no event should any pipeline have a slope less than 1/8 inch per foot.
   2. All soil and waste pipes shall be extended out full size through the roof or connected to a common vent as shown on the Drawings.
   3. Main vent stacks shall run parallel to the soil pipe stacks and shall connect to the vent continuation of the soil stack at least three (3) feet above the rim of the highest plumbing fixtures on the stack. Vent stacks shall also be connected at the base or horizontal offset of the soil stack through a Y and 1/8 bend or an upright Y fittings. Offsets in vent pipe shall be made with 45 degree fittings wherever possible. Horizontal vent lines shall pitch toward the waste line.
   4. Threaded joints shall have American National taper screw thread with graphite and oil compound applied to the male threads.
   5. Piping is to be run straight and plumb and all offsets shall be made at an angle of not less than 45 degrees.

C. Mounting heights, unless otherwise noted, are to the centerline of the equipment and/or device.

3.12 TESTING OF PIPING SYSTEMS

A. General
   1. All piping systems shall be subjected, before being insulated or concealed, to testing with water or air as noted and shall hold tight at the pressure head stated for the time interval

required without adding air or water. While any system is being tested required head or pressure shall be maintained until all joints are inspected.
2. All tests shall be witnessed by the inspector having jurisdiction and the Owner's Representative, with a minimum 48-hour notice given these authorities.
3. All equipment, material, labor and testing mediums required for testing any of the various systems or any part thereof shall be furnished by the Contractor.
4. All connected equipment, accessories, etc. shall be isolated from piping systems prior to testing.

B. Sanitary Piping Systems
1. Water test shall be applied to these drainage systems either in their entirety or in sections as required, after rough piping has been installed. If the system is tested in sections, each opening shall be tightly closed except the highest opening in the section under test. All sections shall be tested with a minimum of 10 feet of head. In testing successive sections, at least the upper 10 feet of the next section shall be tested so that no joint of piping in the building shall be submitted to a test of less than 10 feet of head. The water shall be kept in the system for at least 30 minutes before inspection starts; the system shall then be made tight at all points.
2. Any points of the drainage systems to be tested with air instead of water shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets or outlets, forcing air into the system until there is a minimum gauge pressure of 5 psi. This pressure shall be held without the introduction of additional air for a period of at least 30 minutes.
3. Exterior connections shall be tested as part of the interior systems.

C. Interior Water Piping Systems
1. Upon completion of the entire water supply system or a section of it as required, it shall be tested prior to connection of fixtures and proved tight under a water/air pressure of 150 psi. Pressure shall hold for a period of one hour without introducing additional water/air. Water used for testing shall be from a potable source of supply. Defective joints or piping shall be replaced as required and all piping shall be retested.

D. Exterior Water Piping System
1. All exterior domestic water piping shall be tested to 150 psi for a period of two hours.

E. Compressed Air System
1. All compressed air piping shall be tested to 150 psi for a period of two hours.

F. Defective Work
1. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. All repairs to piping shall be made with new material. Caulking of screwed joints or holes is not acceptable.

G. Additional Tests
1. Provide all additional tests such as smoke or pressure tests as required by the regulations or as directed by authorities making the inspection.
2. Provide for any repeated test as directed by the Owner's Representative, to make all systems tight as required.
3. Visual inspections of joints, valves, etc. shall be made as directed by the Engineer.

3.13 DISINFECTION OF WATER SYSTEM – INTERIOR AND EXTERIOR

A. Prior to project completion, all potable water piping systems shall be disinfected per local code requirements.

B. Whenever the authority having jurisdiction does not specify disinfection procedures, the new water piping system shall be thoroughly disinfected with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or sodium hydrochloride solution and shall be introduced into the system and drawn to all points in the system. The disinfection solution shall be allowed to remain in the system for a period of eight hours, during which period all valves and faucets shall be opened and closed several times. After disinfection, the solution shall be flushed from the system with clear water until the residual chlorine content is not greater than 0.2 parts per million.

C. This work is to be supervised or performed by an approved chemical testing laboratory and results sent to Engineer or his representative for verification.

3.14 FIXTURE CONNECTIONS AND SUPPORTS

A. Wall fixtures shall be hung by means of carrier type fixture supports as manufactured by J.R. Smith, Josam, Mifab, Wade or Zurn.

3.15 SLEEVES

A. Furnish and install pipe sleeves around all piping passing through masonry walls, floors, beams, etc. Sleeves shall be of such diameter as to allow pipe to pass through easily and permit expansion and contraction of pipe. Where pipes are insulated, the sleeves shall be of such diameter as to allow the insulated pipe to pass through easily.
The sleeves shall be placed before the pouring of concrete and before construction of walls. Sleeves for vertical risers shall extend a minimum of 1" above the floor slab. Sleeves to outside walls below grade shall be caulked or provided with expansion type mechanical seals as required to make them waterproof.

B. Spacing between or location of pipe sleeves in floor slabs, structural beams or structural walls shall be subject to the Structural Engineer's approval.

3.16 INSTALLATION OF UNIONS

A. Unions shall be located as shown on plans and as required by equipment so piping and equipment can be easily dismantled. Unions shall not be installed in any location where they are not readily accessible.

3.17 TRAPS

A. All fixtures, drains, etc. shall be provided with traps, unless specifically shown or specified otherwise. Traps shall be set in an upright position, level and true, and shall be vented as shown and required. All exposed traps shall be provided with cleanout plugs.

3.18 CLEANOUT INSTALLATION

A. Furnish and install cleanouts in soil and waste lines as required by Code and/or job conditions, as shown on the Drawings and as follows: At or near the end of each branch and main drainage line, horizontal lines at intervals as required by code. All cleanouts shall be readily accessible, with plugs easily removable for cleanout lines. Cleanouts at the base of vertical piping shall be held within 2'-0" from finished floor unless otherwise indicated.

3.19 FLASHING INSTALLATION

A. All pipes passing through roofs shall be flashed in an approved manner. Flashing shall be watertight.

B. Roof connections shall meet the approval of the manufacturer of roofing material and shall comply with roof bond requirements.

C. The Contractor is to inspect all existing plumbing system roof penetrations and repair/replace flashing as required to provide a watertight installation.

3.20 EQUIPMENT AND MATERIAL PROTECTION

A. During construction all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers.

B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, test plugs until connection to system is made.

3.21 SPACE REQUIREMENTS

A. Piping, apparatus and equipment shall fit into the space provided in the building or within the property and shall be installed at such time and in such manner as to avoid damage to the building structure or property as required by the job progress. Equipment, apparatus and accessories requiring normal servicing or maintenance shall be made easily accessible.

END OF SECTION 22 00 00

SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 22 00 00 - Plumbing General.

1.02 WORK INCLUDED

A. Receipt, unloading, handling, proper storage and protection from damage of all materials.

B. Layout and coordination of work with other trades.

C. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install the plumbing fixtures, trim and supports, complete as indicated on the Drawings and as specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

A. All fixtures shall be white, unless otherwise indicated.

B. All water closets shall have fully glazed trapways.

C. All exposed trim to be heavy polished chrome plated brass, unless otherwise indicated. Chrome plated escutcheons are to be provided on all exposed fixture and food service equipment supplies and waste lines.

D. Electric water coolers shall be ARI Certified and shall carry a UL Listing. Units shall use refrigerant which is approved for use without ozone depleting properties. All waterway components are to be certified as lead free.

E. All sinks and lavatories for use by the disabled shall have manufactured insulation shields on all supplies and P-traps per ADA requirements unless the vanities are provided with ADA compliant shrouds.

F. All exposed plumbing fixture items such as faucets and flush valves shall be provided with vandalproof trim.

2.02 CLEANOUTS

A. Cleanouts on exposed piping in unfinished areas shall be heavy duty cast iron with countersunk plug. Cleanouts shall be Jay R. Smith Figure 4220 or approved equal.

B. Cleanouts installed behind walls in finished areas shall be cast iron ferrule type for no-hub or service weight pipe with nickel bronze round frame and cover with securing screws. Cleanouts shall be Jay R. Smith Figure 4472T or approved equal.

2.03 PLUMBING FIXTURES

A. The following is a list of acceptable manufacturers for the project:
   1. Fixtures: American Standard, Kohler, Toto
   2. Faucets: American Standard, Chicago Faucets, Kohler, Moen, Speakman, Symmons and Zurn
   3. Stainless Steel Sinks: Elkay, Just, Kohler
   4. Trim: American Standard, Brasscraft, Kohler, McGuire and Zurn
   5. Drains, Carriers and Hydrants: Josam, Mifab, Prier, Jay R. Smith, Wade and Zurn

PART 3 - EXECUTION

3.01 INSTALLATION

A. All wall hung fixtures shall be supported on concealed chair carriers furnished complete with all necessary bolts, nuts, washers and gaskets unless noted otherwise. The adjustable nipple between the cast iron fitting and the closet bowl shall be threaded cast iron. Secure all floor pieces to floor slab.

B. All exposed piping in connection with fixtures shall be chromium plated. Where supply and waste lines pass through walls, provide chromium plated escutcheons and firmly secure in place.

C. Provide straight or angle supply valves on inlet supplies to all fixtures.

D. Fixtures, trim and methods of piping and installation shall conform to local plumbing code. All fixture types shall be the product of one manufacturer. All fixtures shall be white unless otherwise noted.

E. Fixtures shall be cleaned, adjusted and left in proper working order before the project is turned over to the Owner. Flush and clean all faucet aerators prior to turn over. Adjust all faucet lever handles to be parallel to adjacent rear wall in the off position.

F. The Contractor shall furnish and install protective guards as required to protect fixtures against damage by normal operations of other trades.

G. Caulk all floor and counter top mounted fixtures and behind all wall-hung plumbing fixtures with white, non-shrinking, silicone caulking eliminating all voids and cracks.

H. Coordinate the mounting height of all fixtures with the Architect prior to installation.

I. The Contractor shall obtain exact information relative to finish grade of the top of the floor drains. All floor drains shall be set flush with finished floors.

J. Cleanouts shall be provided where indicated on drawings and elsewhere as required by code.

K. Where test tees are installed at the base of the stack or on the stack, they may be used as a cleanout.

L. Provide the Owner with three (3) wrenches for removing flush cleanout plugs.

END OF SECTION 22 40 00

SECTION 23 00 00 - HVAC GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Refer to Division 1 - General Requirements and any and all Supplementary or Special Requirements, all of which apply to work described in Division 23 - HVAC as if written in full herein.

B. The scope of work described in these Specifications and/or indicated on the Drawings shall include the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all HVAC systems. All HVAC work shall be accomplished by workmen skilled in the various trades involved.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher implied cost shall be included in the bid, and the Architect shall be notified of the discrepancy in writing.

1.02 CODES AND STANDARDS

A. All HVAC work shall conform to all ordinances and regulations of the City, County and State where the work will take place, including the requirements of all authorities having jurisdiction. The following codes, standards and references shall be observed as a minimum:

1. The 2012 International Building Code
2. The 2012 Uniform Mechanical Code
3. The 2012 International Energy Conservation Code
4. State Amendments to the Code
5. National Fire Protection Association (NFPA) Standards and Guidelines
6. Local and State Fire Marshal requirements
7. Local Building and Inspection Department requirements
8. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
9. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Manuals
10. Underwriters Laboratories Inc. (UL)
11. Americans with Disabilities Act (ADA)

B. If Code or other requirements exceed the provisions shown on the Contract Documents, the Engineer shall be notified in writing. Where requirements of the Contract Documents exceed Code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.03 WORK INCLUDED

The HVAC Systems installed and work performed under this Division of the Specifications shall include, but not necessarily be limited to:

A. Airside Systems
   1. Equipment: including fans, unitary air conditioners, air handling units, furnaces, split systems, etc.
   2. Ductwork and Accessories: including sheet metal, kitchen exhaust ductwork, duct-board, flexible ductwork, fire and smoke dampers, access doors, etc.
   3. Air Distribution Devices: including louvers, registers, grilles, diffusers, etc.

B. Refrigerant
   1. Equipment: including pumps, air separators, expansion tanks, condensing units, etc.
   2. Piping, Tubing and Accessories: including pipe, refrigerant tubing, valves, solenoids, thermal expansion valves, condensate drains, etc.

C. Equipment, Ductwork and Piping Supports
   1. Equipment Mounts: including roof curbs, concrete housekeeping pads, equipment rails, miscellaneous steel, etc.
   2. Hangers and Support Devices: including inserts, hanger rods, unistrut, cross-bracing, anchor bolts, pipe anchors, restraints, etc.
   3. Vibration Isolation and seismic restraint: including inertia bases, flexible couplings, expansion devices, snubbers, springs, waffle pads, seismic restraints, etc.

D. Insulation
   1. Ductwork Insulation: including exterior duct wrap, internal duct liner, fire wrap, etc.
   2. Piping and Equipment Insulation: including preformed, board and wrap.

E. Miscellaneous HVAC Equipment: Unit heaters, wall heaters, roof hoods, heat tracing, etc.

F. Automatic Temperature Controls
   1. Decentralized: including all thermostats, control dampers, control valves, programmable controllers, line and low-voltage wiring, smoke detectors, pressure sensors, gas sensors, control logic, etc.

G. Labor and Equipment: including project management, supervision, tradesmen, lifts, fork-trucks, cranes, scaffolding, saws, wrenches, etc.

H. Equipment and Valve Identification

I. Start-up and Commissioning

J. Demonstration and Owner Training

K. Testing, Adjusting and Balancing

1.04 ENGINEER'S DRAWINGS

A. The locations, arrangement and extent of equipment, devices, ductwork, piping, and other appurtenances related to the installation of the HVAC work shown on the Drawings are

approximate and define the intent of the design. The Contractor shall not scale Engineer's Drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy.

B. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

1.05 EQUIPMENT, MATERIALS AND BID BASIS

A. Manufacturers' names, model numbers, etc. cited on the Drawings and in the Specifications are for the purpose of describing type, capacity, function and quality of equipment and materials required. All project design and coordination between disciplines has been performed as if the named manufacturer and specific piece of equipment will be provided to the project by the Contractor.

B. Alternate equipment and/or materials other than that named on the Drawings and in the Specifications may be proposed for use, but all equipment and materials shall conform entirely to the specified base items. Proposed alternate equipment shall be substantially equal in size, weight, construction and capacity.

Alternate equipment and materials shall be submitted only as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. Requests for prior approval of alternate products shall be made at least ten (10) days prior to the bid date and as required by Division 1 - General Requirements. The Engineer shall consider the use of the alternate equipment based on the supportive documentation made available to him, and shall approve or disapprove any proposed alternates. The decision of the Engineer shall, in all cases, be final.

C. The Contractor shall coordinate the installation of all HVAC equipment proposed for use in this project with all building trades (architectural, structural, electrical, etc.). Coordination shall be accomplished prior to, and shall be reflected in, the equipment submittals for approval. When the Contractor requests substitution of alternate equipment, it is with the knowledge that he shall be responsible for any and all costs required by the substitution, including necessary engineering and construction revisions in his or any other contract or trade to satisfy the design intent shown on the Plans and described in the Specifications.

D. All materials exposed within HVAC plenums shall have a flame-spread index of not more than 25 and a smoke-developed rating index of not more than 50 unless otherwise allowed by code.

1.06 SUBMITTALS

A. The Contractor shall prepare, submit and obtain Engineer's review of all manufacturers' data on the HVAC equipment and systems prior to ordering, purchasing or installing any equipment or materials. Six (6) hard copies of the complete submittal are required, five of which will be reviewed and returned by the engineer. Electronic submittals (e.g. .pdfs, etc.) may be acceptable, if approved by the architect and described in Division 1 - General Requirements.

All submittals shall be transmitted simultaneously in hard ring binders (or in a single .zip file), with the associated specification sections cited and the items submitted clearly identified.

Partial submittals will be returned without review. Submittals, as a minimum, shall include:

1. All HVAC items scheduled on the Drawings
2. Equipment arrangement, ductwork and piping drawings. Contractor drawings shall be prepared at a minimum scale of 1/8" = 1'-0". A scale of 1/4" = 1'-0" scale is preferred. Drawings shall be indicative of actual equipment purchased and shall show all offsets, transitions, fittings, dampers, valves, hanger locations, etc. Sections are required in spatially tight areas (e.g. kitchens, laundries, central plants, mechanical rooms, etc.) The following will guide the Contractor as to minimum drawing detail required:
    a. Clearly indicate top and bottom of duct and pipe elevations. All elevations shall be coordinated as to not conflict with structural, plumbing, electrical and architectural trades.
    b. Indicate all offsets (both vertical and horizontal).
    c. Indicate graphically all duct and pipe joints and their lengths.
    d. Submit duct and pipe-work fabrication schedule indicating duct size range with minimum duct material gauges, pipe schedule being used, duct and pipe connection joint types, section lengths, duct reinforcement type and spacing, etc.
    e. Indicate graphically all ductwork to be fabricated with internal duct liner.
    f. Indicate all insulation for ductwork and piping.
    g. Indicate all dampers and valves as shown on design documents and called for in the specifications.
    h. Indicate all flexible connectors where required by specifications and notes.
3. Flexible ductwork, duct-board, insulation and linings
4. Dampers, louvers, air distribution devices
5. Manufacturer's cut sheets of all piping and tubing materials
6. Where split systems are used in a "long line application," submit manufacturer's refrigerant line set routing drawings and engineered calculations supporting the recommended suction and liquid line sizes. Identify and provide cut sheets of any and all accessories required to make the system complete, functional and reliable.
7. Refrigerant type and charge (lbs.) for each item of equipment utilizing refrigerant.
8. Valves, thermometers, pressure gauges
9. Roof curbs, equipment supports, hanger systems, vibration isolators, seismic restraints
10. Control equipment, systems and diagrams
11. Test and balance reports

B. All submittal approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.

C. Review of submittals by the Engineer does not relieve the Contractor from responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements (roof penetrations, wall penetrations, floor penetrations, curbs, electrical, etc.) of all approved equipment with the other trades and disciplines.

D. All submittals shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.

E. The Contractor shall provide a written statement confirming coordination of voltage requirements for all HVAC equipment requiring an electrical connection. Statement shall bear the names and signatures of the HVAC and electrical contractors. A photocopied reproduction of the below statement is acceptable.

VOLTAGE COORDINATION STATEMENT

This statement is to confirm that the voltages of the equipment provided under this specification have been coordinated with the Electrical Drawings, as well as with the Electrical Contractor.

HVAC Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

Electrical Contractor: _____

Project Manager Name: _____

Project Manager Signature/Date: _____

F. Provide Material Safety Data Sheet (MSDS) or letter from manufacturer certifying the VOC content for each adhesive, sealant, paint and coating.

G. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01 81 13 Sustainable Design Requirements.

1.07 PERMITS

A. The Contractor shall obtain all permits and inspections required for the installation of the HVAC work and pay all charges incident thereto. He shall deliver copies of all certificates of permit and inspection to the Architect.

1.08 COORDINATION OF TRADES

A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Piping and other HVAC equipment shall not be installed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated ductwork, piping and other HVAC equipment installed should they interfere with the proper installation and mounting of electrical, plumbing equipment, ceilings and other architectural or structural finishes.

C. The Contractor shall coordinate the elevations of all ductwork, piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.

D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.

E. The HVAC Contractor shall confirm that his work does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.

F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.

1.09 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare a minimum of two (2) instruction manuals, one of which shall be submitted to the Architect for the Engineer's review. Manuals shall describe installation, operation and maintenance of all HVAC equipment and shall include copies of control schematics, sequences of operation, function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturers' drawings, pamphlets, data, parts lists, and instruction manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in (a) 3-ring binder(s).

1.10 AS-BUILT DRAWINGS

A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. The record shall be by red-line mark-up on the most current set of Engineer's Drawings kept in the field office. After all work is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the Engineer's Drawings. As-built drawings shall accurately depict actual final arrangement of all HVAC items. As-built drawings shall be delivered to the Architect.

1.11 WARRANTY

A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.

B. All reciprocating and scroll air conditioning compressors shall be provided with an extended 5-year parts warranty.

C. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Engineer's Drawings shall be suitable for the intended use and shall be subject to approval by the Engineer.

B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.

C. All equipment shall bear the inspection Label of Underwriters Laboratories Inc.

D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.

E. The VOC content of all products in this section shall not exceed the VOC limits established in Section 01 81 13 Sustainable Design Requirements.

F. VOC Content: Submit adhesive and sealants product information or MSDS showing VOC Content information for all applicable products specified under this section. All applicable products in this section must meet low VOC content as specified by LEED Specification Section 01 81 13 Sustainable Design Requirements.

2.02 ELECTRICAL WORK

A. Except as otherwise specified or noted, electrical equipment used for HVAC systems shall be as specified herein.

B. Motor controls, system controls, starters, disconnects, pilot lights, push buttons, etc. shall be furnished by the HVAC Contractor compatible with the apparatus that it operates. Electrical equipment shall be wired for the voltage shown on the Electrical Engineer's Drawings.

C. Electric motors shall be high efficiency, open drip-proof type unless otherwise specified. Motors shall be standard NEMA continuous duty type and shall bear the UL Label.

Motors shall be selected with a minimum of 15% safety factor greater than the fan brake/horsepower (e.g. 4.75 BHP would require a nominal 7-1/2 HP motor). The motor service factor shall not be used as part of the safety factor. All motors shall have thermal overload protection. Motors shall meet Table MG-1-12C of EPACT 1992.

D. Motors controlled by a variable frequency drive (VFD) shall be inverter duty rated and fully compatible with the VFD provided.

E. Starters for motors 1/3 HP and smaller shall be manual type, and for 1/2 HP and larger, shall be magnetic type. Starters shall be minimum size 0, combination type (with disconnect and lockable handle) with molded case circuit breaker. Starters for motors with remote or automatic

control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.

F. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type unless otherwise indicated on the Drawings or specified herein. Starters for motors 75 HP and greater shall be solid state, reduced voltage type.

G. Motor controls shall be either "Hand-Off-Auto" switches or "On-Off" push buttons with one indicating light. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.

H. Motor starters that are not an integral part of HVAC equipment shall be installed in conformance with Division 26 - Electrical requirements.

I. All "loose" disconnects and starters shall be installed by Division 26.

J. Power wiring to disconnects, starters, and equipment shall be provided and installed by Division 26. All equipment requiring electrical power shall be provided with disconnect switches at each piece of equipment. Coordinate switch type (fused or non-fused) with equipment characteristics, manufacturer's recommendations and electrical drawings.

K. The Contractor shall provide all system controls, control and interlock wiring 120 volts and less in conduits and in accordance with materials and installation requirements of Division 26 - Electrical.

L. All starters shall be labeled on the face of the starter with a semi-rigid plastic laminate nameplate with 1" high white letters on a black background securely affixed to the equipment. The label shall indicate equipment served by the starter (equipment tag used on the Drawings). Labels shall be furnished and installed by the Contractor.

M. All starters for 3-phase equipment shall have overload devices in each phase.

N. Wiring diagrams shall be furnished by the Contractor.

O. Acceptable manufacturers shall be General Electric, Square D, Eaton, Siemens and Allen Bradley.

2.03 AIR FILTERS

A. All filters shall be U.L. 900 classified.

B. Filters shall be pleated disposable type (MERV 6 minimum) unless specified otherwise.

C. Install one set of new filters in air handling equipment during construction and install a new set prior to test and balance. Fan powered induction units shall have a temporary roll filter media installed at the plenum air inlet during construction. Remove temporary filter media prior to test and balance. Clean and vacuum all inlets prior to test and balance.

D. Temporary roll filter media shall be provided at the inlets to all air handling equipment operated during construction. Remove temporary filter media prior to test and balance. Clean and vacuum all inlets prior to test and balance.

PART 3 - EXECUTION

3.01 GENERAL

A. All equipment and materials shall be completely installed, adjusted, and fully operational with all accessories and connections.

B. Equipment, piping, ductwork, etc. shall fit into the spaces provided in the building and shall be installed at such time and in such a manner as to avoid damage and as required by the job progress. The Contractor shall coordinate work with other trades and locate work described herein to avoid interferences with structural, electrical and architectural work. Equipment, accessories and similar items requiring normal servicing or maintenance shall be accessible.

C. The Engineer reserves the right to direct the removal of any item which, in his opinion, does not present an orderly and reasonably neat or workmanlike appearance. Such removal and replacement shall be done when directed by the Engineer and without additional cost to the Owner.

D. Listed mounting heights are to the finished bottom of the device unless otherwise noted.

E. All work shall be designed and installed to comply with the requirements for the seismic design category and use group for the area in which the building is constructed.

3.02 STORAGE AND PROTECTION OF MATERIALS

A. During construction, all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers, etc.

B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, and test plugs until final connection to system is made.

C. All equipment, piping and ductwork shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.

D. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in a manner to prevent damage to materials during storage and handling. Replace damaged materials.

E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.03 CUTTING AND PATCHING

A. The work shall include all cutting and patching required as part of the HVAC installation. Refer to Division 1 - General Requirements.

3.04 CONCRETE WORK

A. Construct curbs, pads and similar supports for equipment where required.

B. Provide 4" thick housekeeping pads for all floor mounted equipment, extending 6" beyond the area occupied by the equipment. Dowel pads to structural slab.

C. Perform concrete work in accordance with applicable portions of Division 3 - Concrete. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

D. Mix and install grout for HVAC equipment base bearing surfaces and anchors. Provide forms as necessary and place grout to completely fill equipment bases.

3.05 EQUIPMENT SUPPORTS

A. Major equipment supports (structural steel frames, framed structural slab and wall openings, etc.) shall be furnished and installed by others; however, the HVAC work shall include furnishing and installation of all miscellaneous equipment supports, structural members, rods, clamps and hangers required to provide adequate support of all HVAC equipment.

B. Unless otherwise shown on the Drawings, all HVAC equipment, piping, and accessories shall be installed level, square, and plumb.

C. All equipment, piping, etc. supported by structural bar joists shall be supported only by the top chord of the joists. Hangers shall not be attached to the bottom chord of any joists.

3.06 PIPE AND DUCTWORK PENETRATIONS

A. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe and ductwork penetrations. Sleeves for pipe shall be schedule 40 black steel. Sleeves for ductwork shall be 20-gauge galvanized steel. Sleeves shall be sized to provide a minimum of 1/4" clearance between the sleeve and pipe or duct. For insulated pipes or ducts, the clearance shall be between the sleeve and the insulation.

B. As far as possible, all pipe and ductwork penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.

C. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, escutcheon plates shall be chrome plated. All escutcheon plates shall be sized to completely conceal the penetration.

D. Ductwork penetrating walls or floors of any material shall be installed with closure plates on both sides of the penetration. Pipe penetrations through exterior walls shall be sealed

weather-tight with expandable link type seals by Thunderline, Linkseal, or Engineer approved equal.

E. All pipe and duct penetrations of fire, smoke, or fire and smoke-rated assemblies shall be fire-stopped as required to retain the integrity of the UL-rated assembly. Fire barrier products shall be as manufactured by Tremco, Hilti, 3M, Metacaulk, Nelson, or approved equal. Refer to Division 7 - Thermal and Moisture Protection.

3.07 FLASHING

A. All piping and ductwork penetrating roofs shall be flashed in an approved manner, shall be watertight, and shall conform to the requirements detailed in Division 7 - Thermal and Moisture Protection.

3.08 EQUIPMENT LABELING

A. All HVAC equipment shall be labeled. This shall include all central plant, air handling or air conditioning equipment, air terminals, and other similar and miscellaneous equipment.

B. Equipment labeling shall be one of the following, unless noted or specified otherwise:
   1. Permanently attached plastic laminated signs with 1" high lettering
   2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel

3.09 CLEANING

A. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the job site.

B. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, ductwork, etc. shall be thoroughly cleaned both inside and out.

C. All water piping shall be chemically flushed and cleaned prior to circulating water through equipment.

D. After cleaning, filters shall be installed where required and all systems shall be tested and balanced.

E. After testing and balancing and just prior to Owner review and acceptance, all systems shall be finally cleaned and left ready for use.

3.10 PAINTING

A. Painting will be done under Division 9 - Painting except as otherwise noted, but the HVAC Contractor shall leave all surfaces of work free of rust, dirt and grease.

B. The HVAC Contractor shall touch-up any equipment scratched in shipment or during installation to match original finish. Touch-up painting of HVAC equipment shall be part of the HVAC work.

C. Any visible ductwork through grilles, registers and diffusers shall be painted flat black.

D. Provide one coat of rust preventive primer on all new structural steel supports and new ferrous surfaces not galvanized, including HVAC piping. Rust preventive painting shall be part of the HVAC work. Rust preventive paint shall be "Rust Destroyer" by Advanced Protective Products, Inc., Fairlawn, NJ, (201) 794-2000. Product shall have a 5-year warranty when applied directly over rust. Clean and prepare surface per manufacturer's recommendations.

E. All painting and coating shall match the original finish and shall conform to the requirements detailed in Division 9 - Finishes.

F. Do not paint over equipment nameplates, nonferrous hardware, accessories or trim.

3.11 PRESSURE TESTING

A. Unless otherwise specified herein, all HVAC piping shall be tested as required by Code to 1-1/2 times the rated system pressure or 100 psig, whichever is greater. Care shall be taken to isolate all equipment not suitable for this test pressure by installing pipe caps or blank flanges at the equipment connections. All valves and fittings shall be tested under pressure.

3.12 PERFORMANCE AND DEMONSTRATION TESTS

A. All testing and demonstration of any and all HVAC systems required for acceptance by any authorities having jurisdiction shall be included as part of the HVAC work. This shall include the furnishing of any and all testing equipment, smoke generation devices, and any other required equipment or accessories, and all necessary labor required to perform any required tests or demonstrations. The Contractor shall coordinate and verify all devices, equipment and sequence of testing and/or events with such authorities having jurisdiction. The Contractor shall perform a minimum of two (2) satisfactory preliminary tests or demonstrations prior to any formal tests and/or demonstrations for any code authorities, and shall give a minimum of five (5) days advance notice to the Engineer of any and all preliminary tests and/or demonstrations, indicating the date and time of such tests.

3.13 TRAINING

A. Upon completion of the work, the Contractor shall conduct operation and training session(s) for the Owner's key operating personnel. These sessions shall be of sufficient length and duration to adequately explain the design intent and proper operating and maintenance techniques for all HVAC equipment and systems. After these sessions are completed, the Contractor shall provide a copy of a signed statement by the Owner that his personnel are thoroughly familiar with and capable of operating all HVAC equipment and systems.

END OF SECTION 23 00 00

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING (TAB)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Refer to specification section 23 00 00 - HVAC General, all of which applies to work described in this section as if written in full herein.

B. The work described by this section of the specifications consists of furnishing all materials, instruments, labor, and appurtenances to test, adjust and balance all of the HVAC systems furnished and installed under Division 23 of the specifications.

C. The TAB agency shall be a subcontractor of the General Contractor and shall not report to or be paid by the HVAC Contractor. The HVAC subcontractor shall be responsible to cooperate with and provide for the balancing subcontractor any and all materials, services, labor, etc. to facilitate completion of the balancing work.

1.02 QUALITY ASSURANCE

A. The TAB agency and its specialist shall be certified members of Associated Air Balance Council (AABC) or certified by the National Environmental Balance Bureau (NEBB) to perform TAB service for HVAC, and vibration and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein. The TAB agency shall have been in business for at least the past five years and must be free of disciplinary action by either the AABC or the NEBB during that time.

B. All TAB technicians performing actual TAB work shall be experienced and must have done satisfactory work on a minimum of 3 projects comparable in size and complexity of this project and must be certified so by the TAB agency in writing.

C. The basic instrumentation shall be calibrated to accuracy requirements by its manufacturer, AABC or NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems. Provide calibration history of the instruments to be used for test and balance purpose.

D. One or more of the applicable AABC, NEBB or SMACNA publications, supplemented by the ASHRAE Handbooks and requirements stated herein shall be the basis for planning, procedures, tolerances and reports. Final report shall cite the exact names of publications used as a basis or reference for the TAB work or reports.

1.03 DEFINITIONS

A. Retain definition(s) remaining after this Section has been edited.

B. AABC: Associated Air Balance Council.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An entity engaged to perform TAB Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide plastic plugs to seal holes drilled in ductwork for test purposes.

B. Provide for repair of insulation removed or damaged for TAB work to match installation.

PART 3 - EXECUTION

3.01 TAB PROCEDURES

A. TAB shall be performed in accordance with the requirements of the Standard under which the TAB agency is certified, either AABC or NEBB.

B. During TAB all related system components shall be in full operation. Fan and pump rotation, motor loads and equipment vibration shall be checked and corrected as necessary before proceeding with TAB. Set controls and/or block off parts of distribution systems to simulate design operation of variable volume air or water systems for test and balance work.

C. Adjustment of the temperature controls shall be coordinated by the TAB work specialist in conjunction with the Automatic Temperature Control Company's Engineer. Both shall cooperate to simulate a complete cycle for every system in every mode of operation (automatic, economizer, fire emergency, etc.).

D. Coordinate TAB procedures with any phased construction completion requirements for the project. Provide TAB reports for each phase of the project prior to partial final inspections of each phase of the project.

3.02 AIR SYSTEMS TAB

A. Systems shall be tested, adjusted and balanced so that air quantities and temperatures at outlets are as shown on the Contract Drawings and so that the distribution from supply outlets is uniform over the face of each outlet.

B. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but air quantities in ducts having velocities of 1,000 feet per minute or greater shall be measured by means of pitot tubes and inclined gauge manometers. Instrument test opening enclosures shall be provided as required at the direction of the TAB agency.

C. Adjustments shall be made in such a manner that splitter and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Primary balancing shall be obtained by adjustment of the dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Additional dampers

or other air volume adjusters required to accomplish the balancing and adjusting shall be furnished and installed as part of the HVAC work.

D. Artificially load air filters by partial blanking to produce air pressure drop of at least 90 percent of the design final pressure drop.

E. Check and readjust factory set minimum and maximum air terminal unit flow rates if necessary. Balance air distribution on full cooling maximum. Reset room thermostats and check operation from maximum to minimum cooling, to the heating mode, and back to cooling. Record and report the heating coil leaving air temperature when in the maximum heating mode.

F. Adjust fan speeds to provide design air flow. Adjust V-belt drives, including fixed pitch pulley requirements.

G. After completion of the testing, adjusting and balancing of the air systems, six (6) copies of a recognized complete set of reports showing the minimum following information shall be submitted to the Engineer for review:
   1. Systems inspection narrative on equipment and installation for conformance with design
   2. Duct Air Leakage Test Report
   3. Systems Readiness Report
   4. TAB report covering flow balance and adjustments, performance tests, vibration tests and sound tests. Required information:
      a. Location of each air outlet or inlet. This shall be presented in the form of a reduced size floor plan showing outlet number keyed to the outlet number in the report.
      b. Dimensions or size of each outlet or inlet
      c. Type and manufacturer of diffusers, grilles, registers. Indicate duty as supply, return, exhaust, etc.
      d. Cfm of air as indicated on the Drawings for each outlet or inlet with corresponding velocity
      e. Velocity of air as measured and corresponding cfm at which system has been balanced and adjusted, for each outlet or inlet
      f. Velocity of air measured and corresponding cfm, after each complete system has been balanced and adjusted, for each main branch or zone duct at the supply fan, the return fan and the exhaust fan, as the case may be
      g. After each complete system has been balanced and adjusted, the total cfm at fan discharge, the total return air to the apparatus, the total outside air to the apparatus, the total outside air to the apparatus, static pressure at fan outlet, total static pressure for apparatus, fan speed, motor amperage for each phase and voltage
   5. Narrative of uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements

H. The above testing, adjusting and balancing shall be performed for the first season of the year, cooling season or heating season, which occurs at the completion of the building. Additional balancing and adjusting which may be required for the season of the year next following shall be performed as part of the work under this specification.

I. Ventilation air distribution systems (outdoor air and exhaust air) shall be balanced to achieve the airflow rates indicated on the drawings. These airflow rates shall be considered minimum rates. The measured air balance tolerance for both outdoor air and exhaust air rates shall be -0% to +10%.

3.03 VIBRATION TESTING

A. Furnish instruments and perform vibration measurements for all rotating HVAC equipment of 1/2 horsepower and larger, including centrifugal/screw compressors, cooling towers, pumps, fans and motors.

B. Record initial measurements for each unit of equipment on test forms and submit a report to General Contractor. Where vibration readings exceed the allowable tolerance, the HVAC Contractor shall correct the problem and the TAB agency shall verify the corrections are done for final reporting.

3.04 SOUND TESTING

A. Perform and record required sound level measurements in approximately 15% of all rooms as designated by the General Contractor.

B. Take measurements with a calibrated sound level meter and octave band analyzer of the accuracy required by AABC or NEBB.

C. Where measure sound levels exceed specified levels, the installing contractor or equipment manufacturer shall take remedial action approved by the General Contractor and the necessary sound tests shall be repeated.

3.05 MARKING OF SETTINGS AND TEST PORTS

A. Following the approval of the final TAB Report, the setting of all HVAC adjustment devices including valves, splitters and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time. Style and colors used for markings shall be coordinated with the General Contractor.

B. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

END OF SECTION 23 05 93

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 23 00 00 - HVAC General.

1.02 WORK INCLUDED

A. The work done under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install all insulation, complete, as indicated on the Drawings and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials as specified in this section shall be manufactured by Armstrong, Johns-Manville, Knauf, Pittsburgh-Corning, Certainteed, Pabco, Dow Chemical, Owens Corning or approved equal.

B. Insulation thicknesses shall be as shown in the following table:

Minimum Pipe Insulation			Insulation Thickness for Pipe Sizes					
Piping System Types	Fluid Temperature Range		Runouts 2 in. +	1 in. and Less	1-1/4 to 2 in.	2-1/2 to 4 in.	5 and 6 in.	8 in. and Larger
Refrigerant or Brine	Below 4.5	Below 40	1.5	1.5	1.5	1.5	1.5	1.5

C. Unless noted otherwise, the abovementioned piping systems inside the building shall be insulated with a 5 lb/cu. ft. (nominal) density sectional fiberglass insulation with a thermal conductivity (k factor) not to exceed 0.24. The jacket shall be fire retardant with a suitable vapor barrier. All joints and seams shall be sealed vapor tight. All joints and seams shall be lapped in place to form a continuous vapor barrier covering. All seams shall then be covered with "All Service Jacket" (ASJ) 3" wide tape. The tape shall match the jacket. The tape shall be squeegeed in place to provide complete adhesion of the tape to the jacket and to provide a continuous vapor barrier covering. Exterior water piping shall be heat traced (Refer to Section 23 21 13 - Piping and Accessories).

D. Piping installed outdoors shall be insulated with cellular glass insulation, Pittsburgh-Corning "Foamglas" or approved equal. Insulation thickness required to prevent condensation shall be determined by the manufacturer for worse case ambient conditions.
   1. Install with all service jacket and in accordance with manufacturer's recommendations.
   2. Where heat tracing is specified, oversize insulation to allow space for heat tape.

E. Equipment shall be insulated in the same manner as specified for the associated piping.

F. Provide high density preformed pipe insulation inserts at all pipe hangers. Inserts shall be equal to Foamglas by Pittsburgh Corning or calcium silicate. Provide ribbed hanger saddles by Centerline, Buckaroos, Inc. or approved equal.

G. All exposed insulated piping in mechanical rooms below 10'-0" AFF shall be protected by a corrugated aluminum jacket with bands 3'-0" on center.

H. Ductwork
   1. All supply air ducts with heated or cooled air shall be insulated. All return ducts in concealed and unheated areas shall be insulated.
   2. Toilet and general exhaust ductwork exhausting air conditioned air and routed in attic spaces shall be insulated.
   3. Ductwork described in 1. and 2. above shall be insulated with 2" thick fiber glass blanket type, 3/4 lb/cu. ft. with reinforced foil faced vapor barrier (R-5 min.). Insulation shall be securely adhered to ductwork. All joints shall be sealed with 3" wide strips of foil faced vapor barrier tape and applied to form a continuous vapor seal.
   4. Ducts within mechanical rooms shall be insulated with 1" thick, 3 lb/cu. ft. rigid fiberglass board with an R factor of not less than 5 (K = 0.235 at 75 degrees F mean temperature) with reinforced foil vapor barrier. Insulation shall be secured to ductwork with stick pins and speed washers. All joints and stick pin terminations shall be sealed with 3" wide strips of vapor barrier material and applied to form a continuous vapor seal.

I. All outside air ducts shall be insulated. Outside air ducts located within mechanical rooms shall be rigid fiberglass board as described above. All other outside air ducts shall be blanket type insulated as described above.

J. Sheet metal supply, return, and outside air ductwork in non-air conditioned areas shall be insulated with 2" thick 1½" lb/cu. ft. fiberglass blanket duct insulation with foil faced vapor barrier (R-6 min.).

K. Exterior supply and return air ductwork shall be constructed of galvanized sheet metal lined with 2" thick 3 lb/cu. ft. duct liner board (R-8 min.). All seams shall be externally sealed watertight with a 20-year silicone caulk and coated with a rust preventive coating over the entire duct surface.

L. Provide insulating tape over all piping specialties to prevent condensation such as drain valves, drain plugs, combination temperature/pressure test plugs, etc.

M. All insulation must meet applicable codes for Flame Spread and Smoke developed ratings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Shop drawing submittals shall include a complete package of materials and methods intended for use as described in this section.

B. All work shall be in strict accordance with applicable codes, ordinances and the manufacturer's recommendations.

C. All work shall be performed in a professional workmanlike manner and standard trade practice. It shall be smooth in appearance and suitable for finish painting.

D. All exterior piping shall be installed with a corrugated aluminum jacket with bands 3'-0" on center.

E. Fiberglass pipe insulation shall be applied to clean (free of rust) dry pipe prior to leak testing.

END OF SECTION 23 07 00

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install all materials, labor, accessories, etc. shown on the Drawings and specified herein to completely install all piping systems.

B. Refrigerant piping shall meet the requirements of the Safety Standard for Refrigeration Systems (ANSI/ASHRAE Standard 15-Latest Edition) and the Code for Pressure Piping (ANSI/ASME Standard B31.5-Latest Edition: Refrigeration Piping and Heat Transfer Components).

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this section.

1.03 RELATED REFERENCES

A. Designation and Safety Classification of Refrigerants (ANSI/ASHRAE Standard 34-Latest Edition).

PART 2 - PRODUCTS

2.01 REFRIGERANT PIPING

A. Piping shall be:
   1. Type “L” hard drawn seamless copper tube conforming to ASTM B88, or
   2. Type “ACR” (Air Conditioning Refrigeration) service copper tubing conforming to ASTM B280.
      a. Annealed coils shall be dehydrated, purged with Nitrogen and tightly capped to insure cleanliness. Piping shall be engineered and constructed to support R-410A to 700 psi @ 250°F.

B. Fittings shall be wrought copper conforming to ASME/ANSI Standard B16.

C. Joints shall be brazed. Brazing filler metals shall comply with AWS A5.8.

D. Valves, filter-driers and other accessories shall be suitable for refrigerant service.

2.02 INSULATION

A. Refrigerant piping shall be insulated with flexible elastomeric tubing insulation, AP Armaflex Pipe Insulation manufactured by Armacel or equal. Where possible, insulation shall be slid over piping from one end before pipe ends are joined and shall not be slit or cut. All joints and seams shall be sealed weather-tight.

B. Insulation thickness shall be as follows:

ASHRAE 90.1-2007

1. VRF Heat Pump and Heat Recovery Systems – Insulate all piping:
   a. <1-1/2" pipe 1/2" insulation
   b. 1-1/2"<4" pipe 1" insulation

C. Finish coat for flexible elastomeric insulation installed outdoors shall be water-based latex enamel designed for use over all forms of flexible elastomeric insulation. Finish coat shall provide a protective finish suitable to both indoor and outdoor applications, formulated for cold weather flexibility to resist cracking and weather-resistant to ultraviolet (UV) and ozone. Coating shall be Armaflex WB Finish or equivalent.

PART 3 - EXECUTION

3.01 GENERAL

A. Refrigerant piping shall be supported as shown on the Drawings and as required at intervals not over 8'-0" O.C. and at all turns and offsets. Hangers and pipe clamps shall be copper plated tubing hangers of adequate size to fit around tubing and insulation as required. Saddles shall be used under insulated tubing to protect insulation. Piping routed in excess of 6 (six) lineal feet on the roof shall be supported by B-Line "Dura-Blok" rooftop supports or approved equal.

B. Pressure testing of piping systems shall be in accordance with standard industry practice for the refrigerant used.

C. Refrigerant piping shall be clean and free of outside contaminants at all times. Prior to start-up of any equipment or insulation installation, all piping shall be cleaned, tested, dehydrated and charged as recommended by the refrigerant compressor manufacturer.

1. Procedure: Joints and connections in refrigerant piping shall not be installed in partitions or walls or where inaccessible for testing, inspection and rework. Make provisions to prevent contact of dissimilar metals. During construction, cap all tubing to prevent moisture from entering. Keep in dry location.
2. Leak testing and recharging: Upon completion of installation of air conditioning equipment, test all refrigerant piping, components and accessories, including quick-connect refrigerant connectors for evaporator and condensing unit; test with a halide torch; prove tight by Contractor to assure a leak-tight refrigerant system. If leaks are detected at the time of installation or during warranty period, remove entire refrigerant charge from system, correct leaks, and retest system. After system is found to be leak free, evacuation shall be accomplished by use of a reliable gauge and a vacuum pump capable of pulling vacuum of at least one mm Hg absolute. Accomplish system evacuation in strict accordance with equipment manufacturer's printed instruction. System leak testing, evacuation, dehydration and charging with refrigerant shall comply with standard industry practice and local codes and ordinances.

D. All joints in refrigerant piping shall be made accessible. Joints shall not be permitted below concrete.

E. Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps or shall be otherwise secured to prevent unauthorized access.

F. All piping shall be run true to grade and shall be arranged to make the best possible appearance. Except where otherwise required by conditions of installation, all piping shall be symmetrical and parallel with lines of buildings or structure in which it is installed. All piping shall be run concealed except in mechanical room and where indicated otherwise.

G. All piping and equipment shall be supported and guided. Anchors shall be provided to absorb or transmit thrust and eliminate vibration or pulsation. Hangers or supports shall be provided near each change of direction. Supports shall be so located or shall be of such type as not to unduly restrict the movement of the pipe due to lateral or longitudinal expansion.

END OF SECTION 23 23 00

SECTION 23 31 00 - DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. All work in this section shall be subject to the provisions of Section 23 00 00 - HVAC General.

B. Furnish and install all material, labor, accessories, etc. shown on the drawings and as specified herein to completely install all ductwork systems.

C. Ductwork systems shall be classified as follows:
   1. Static pressure class +2 in. wg - from constant volume air handling unit, and terminal unit to supply diffusers, and all return and exhaust ductwork

D. Ductwork shall be constructed according to the latest edition of SMACNA ductwork construction standards applicable to the system pressures described above, and the system material construction.

E. Duct sizes shown on the drawings are nominal inside clear.

1.02 SUBMITTALS

A. For all fire dampers, combination fire and smoke dampers, and smoke dampers, submit UL approved installation instructions for each specific application.

PART 2 - PRODUCTS

2.01 DUCTWORK

A. All ductwork shall be constructed of galvanized steel sheets of the thickness listed in the SMACNA manuals for the pressures referenced above, or of 1" thick (1½" thick if required by the applicable energy code) resin bonded fiberglass with fire resistant foil-scrim-kraft vapor barrier.

B. Rectangular sheet metal duct elbows shall be smooth radius type without turning vanes or square (or mitered) type with turning vanes. Sharp throat elbows (ASHRAE Fitting No. CR3-2) shall not be permitted. Round sheet metal duct elbows shall be smooth radius type without turning vanes, gored type or mitered type with turning vanes.

C. Unless otherwise indicated, elbows shall have a centerline radius of not less than 1½ times the width of the duct. Where space limitations necessitate use of short radius or square elbows, provide turning vanes.

D. Fiberglass ductwork shall be UL-181 listed class 1 duct material with a minimum thermal conductivity of 0.23 at 75 degrees F.

E. Fiberglass ductboard shall be Johns-Manville “Superduct” Type 475, Knauf air duct Type E1-475 or Certainteed “Toughgard.”

F. Ductwork connecting kitchen exhaust hoods to rooftop exhaust fans shall be constructed of 16-gauge black steel with welded seams. All grease exhaust ductwork shall be constructed and installed according to requirements of local code authorities and NFPA 96 (latest edition) requirements. Slope duct down towards hood at 1" per linear foot or per local code requirements. Install gasketed access doors at each change of direction.

G. Kitchen hood exhaust ductwork shall be insulated per NFPA 96 (latest edition) and local code requirements. Kitchen hood supply ductwork shall be insulated per specifications for HVAC supply ductwork.

H. Dishwasher exhaust ductwork above the ceiling shall be either 18-gauge stainless steel or 16-gauge aluminum. All seams and joints shall be welded liquid-tight.

I. Dishwasher exhaust risers and trim collars below the ceiling shall be 18-gauge, type 304 stainless steel finished in a 180 grit polished finish.

J. All dishwasher exhaust ductwork shall slope down toward the dishwasher connections at 1/4" per foot and be constructed with no pockets which will trap condensation.

2.02 FIRE DAMPERS

A. Fire dampers shall be installed at all locations where ductwork or supply or return air openings penetrate any floor, wall or partition with a fire rating.

B. All fire dampers shall be of the "Dynamic" type as classified in UL Standard 555.

C. Fire dampers shall have a rating compatible with the floor, wall or partition, shall be tested to UL Standard 555 and be labeled for the intended installation (horizontal or vertical).

D. Maximum pressure drop: 0.10" wg; provide ductwork transitions as required so as not to exceed maximum pressure drop.

E. Fire Resistance Rating: 1½ hours unless noted otherwise indicated on drawings for 3 hours.

F. Closure device: Each fire damper shall be equipped with a factory installed heat responsive device (fusible link) rated to close the damper when temperature at the damper reaches: 165°F.

G. Airflow Closure Rating:
   1. Dynamic fire dampers shall be selected for the velocity and pressure rating of the intended installation. Refer to the plans and schedules for airflow rates (CFM) and pressures (in. wg).
   2. Dampers shall have a minimum velocity rating of 2000 fpm at a pressure rating of 4 in. wg.
   3. Dampers in systems operating above 2000 fpm or 4 in. wg shall be selected for a velocity rating of 4000 fpm at a pressure rating of 6 in. wg or a velocity rating of 6000 fpm at a pressure rating of 8 in. wg as required.

H. Types:
   1. Curtain Style: for use in systems up to 4000 fpm velocity; Type B or C with the blade stack out of the airstream (Type A with the blade stack in the airstream may be used behind grilles or where space conditions do not permit the use of a Type B damper).

a. Construction:
1) Frame: Galvanized steel (in gauges required by manufacturer's UL listing).
2) Blade design: interlocking galvanized steel
3) Sleeves: Damper shall be supplied as a single assembly with a factory sleeve.
4) Retaining Angles: Damper shall be supplied with factory retaining angles sized to provide installation overlap in accordance with the manufacturer's UL listing.
5) Duct Transition Connection: breakaway type

2. Round: for use in systems up to 2000 fpm velocity.
a. Construction:
1) Frame: Galvanized steel (in gauges required by manufacturer's UL listing).
2) Blade design: single galvanized steel blade (in gauge required by manufacturer's UL listing).
3) Retainer plate(s): supplied with damper.
4) Sleeves: Length as required per wall thickness.
5) Duct Transition Connection: breakaway type.

3. Multi-blade:
a. Up to 2000 fpm velocity: Triple vee-groove type blade.
b. 2000-4000 fpm velocity: Fabricated double skin airfoil type blade.
c. Construction:
1) Frame: Galvanized steel with mitered and interlocking corners (in gauges required by manufacturer's UL listing).
2) Blade design: 16 ga. galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.
3) Sleeves: Damper shall be supplied as a single assembly with a factory sleeve.
4) Retaining Angles: Damper shall be supplied with factory retaining angles sized to provide installation overlap in accordance with the manufacturer's UL listing.
5) Duct Transition Connection: breakaway type

I. All dampers shall be installed in strict accordance with the manufacturer's UL approved installation details.

J. Where fire dampers are required in a fibrous glass ductboard system, provide sheet metal sleeve per manufacturer's UL installation instructions. Verify gage of sleeve and attachment angle with governing code authorities. Installation shall also conform to SMACNA Figure 5-9 "Fibrous Glass Duct Installation".

2.03 CEILING RADIATION DAMPERS

A. A listed ceiling radiation damper shall be installed at all locations where ductwork or register, diffuser, grille, etc. penetrates the ceiling membrane of a fire-resistance-rated floor/ceiling or

roof/ceiling assembly. Ceiling radiation dampers shall have a rating compatible with the floor/ceiling or roof/ceiling assembly and shall be tested to UL Standard 555C.

B. Fire Resistance Rating: 1 hour (minimum).

C. Closure device: Each ceiling radiation damper shall be equipped with a factory installed heat responsive device (fusible link) rated to close the damper when temperature at the damper reaches: 165°F.

D. Construction:
   1. Dampers shall be factory built curtain or butterfly type. They shall conform to the requirements of NFPA Standard 90A and be UL Labeled for the required assembly rating.
   2. All dampers shall be installed in strict accordance with the manufacturer's UL approved installation instructions.
   3. Provide steel sleeves, mounting angles and steel duct drops of design and length where required to permit mounting within the opening.
   4. Provide thermal blanket where required by the manufacturer's UL installation instructions.
   5. Where ceiling radiation dampers are shown on the drawings, and if fiberglass ductwork is used, dampers shall be installed with a sheet metal collar or housing or shall be listed for use with fiberglass ductwork.
   6. Where fiberglass ductboard plenums are used they shall conform to manufacturer's Fiberglass Ductboard Plenum Installation Instructions.

2.04 COMBINATION FIRE AND SMOKE DAMPERS

A. Fire/smoke dampers shall be installed at all locations where ductwork or supply or return air openings penetrate any floor, wall or partition with a fire and smoke rating, or where otherwise shown on the drawings.

B. Fire/smoke dampers shall be provided with actuators capable of closing the damper on activation of area smoke detectors, the fire alarm system and/or the Firefighter's Smoke Control Panel, and shall be normally closed. Actuators shall be compatible with the activating smoke detectors or fire alarm system (coordinate with other trades).

C. Unless otherwise indicated, smoke detectors integral to the combination fire/smoke damper shall be furnished and installed by the fire alarm contractor (coordinate with other trades).

D. All combination fire/smoke dampers shall be of the "Dynamic" type as classified in UL Standards 555 and 555S.

E. Fire/smoke dampers shall have a rating compatible with the floor, wall or partition, shall be tested to UL Standards 555 and 555S and be labeled for the intended installation (horizontal or vertical).

F. Maximum pressure drop: 0.10" wg; provide ductwork transitions as required so as not to exceed maximum pressure drop.

G. Fire Resistance Rating: 1½ hours unless noted otherwise on drawings for 3 hours.

H. Leakage Rating: Class 1 (maximum of 8 cfm/ft^2 at 4 in. wg) unless noted otherwise.

I. Elevated Temperature Rating: 350°F (177°C) for 30 minutes.

J. Airflow Closure Rating:
   1. Dynamic fire/smoke dampers shall be selected for the velocity and pressure rating of the intended installation. Refer to the plans and schedules for airflow rates (CFM) and pressures (in. wg).
   2. Dampers shall have a minimum velocity rating of 2000 fpm at a pressure rating of 4 in. wg.
   3. Dampers in systems operating above 2000 fpm or 4 in. wg shall be selected for a velocity rating of 4000 fpm at a pressure rating of 6 in. wg or a velocity rating of 6000 fpm at a pressure rating of 8 in. wg as required.

K. Types:
   1. Round: for use in systems up to 3000 fpm velocity.
      a. Construction:
         1) Frame: Galvanized steel (in gauges required by manufacturer's UL listing).
         2) Blade design: single galvanized steel blade (in gauge required by manufacturer's UL listing).
         3) Retainer plate(s): supplied with damper.
         4) Sleeves: Length as required per wall thickness.
         5) Duct Transition Connection: breakaway type.
   2. Multi-blade:
      a. Up to 2000 fpm velocity: Triple vee-groove type blade.
      b. 2000-4000 fpm velocity: Fabricated double skin airfoil type blade.
      c. Construction:
         1) Frame: Galvanized steel with mitered and interlocking corners (in gauges required by manufacturer's UL listing).
         2) Blade design: 16 ga. galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.
         3) Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than ½" of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.
         4) Seals:
            a. Blade Edge: Blade seals shall be extruded silicone rubber permanently bonded to the appropriate blade edges.
            b. Jamb: Flexible stainless steel compression type.
         5) Linkage: Concealed in jamb.
         6) Axles: Minimum ½" diameter plated steel.
         7) Bearings: Axle bearings shall be sintered bronze sleeve type rotating in polished extruded holes in the damper frame.
         8) Sleeves: Damper shall be supplied as a single assembly with a factory sleeve.

9) Retaining Angles: Damper shall be supplied with factory retaining angles sized to provide installation overlap in accordance with the manufacturer's UL listing.

10) Duct Transition Connection: breakaway type

L. Heat Responsive Device: Electric, controlled closure, quick detect heat-actuated device designed to prevent damage to ductwork and other HVAC system components. The device shall be a reusable/resettable link (RRL) with a temperature setting of 165°F (74°C).

M. Damper Motors: Two-position meeting the following:

1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so the driven load will not require motor to operate in service factor range above 1.0.
   b. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
   c. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   d. 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).
   e. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40°F (minus 40°C).
   f. 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).
   g. Electrical Connection: 115 V, single phase, 60 Hz.

N. Momentary Test Switch (for use in combination fire and smoke dampers that are not part of a smoke management system): factory mounted and wired assembly for testing and cycling the damper during start-up and maintenance.

O. Accessories for active smoke management systems:

1. Open Closed Indicator (OCI): factory mounted and tested with two switches, one set to close when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. This will be wired to the Fire Fighter's Smoke Control Station to indicate true damper position.
2. Temperature Limited Override: factory mounted and tested with two temperature sensing devices (thermostats) with fixed settings (165°F [74°C] and 350°F [177°C]). The primary sensor (with the 165°F [74°C] setting) may be bypassed by an external electrical signal allowing the damper to reopen and remain open until the temperature reaches the setting of the secondary sensor (350°F [177°C]). When the temperature of the secondary sensor is exceeded, the damper closes and remains closed thereafter.
3. Test Switch and Indicator Panel: 5" x 5" control panel with toggle switch, red LED (replaceable) indicator light to indicate closed damper position and a green LED (replaceable) indicator light to indicate open damper position.

P. Combination Fire and Smoke Dampers shall have a single point wiring per UL requirements (except where two signals are required as with the Temperature Limited Override specified above).

2.05 SMOKE DAMPERS

A. Smoke dampers shall be installed at all locations where ductwork or supply or return air openings penetrate any floor, wall or partition with a smoke rating, or where otherwise shown on the drawings, except where such ductwork or openings are part of an engineered smoke removal system.

B. Smoke dampers shall be provided with actuators capable of closing the damper on activation of area smoke detectors, the fire alarm system and/or the Firefighter's Smoke Control Panel, and shall be normally closed. Actuators shall be compatible with the activating smoke detectors or fire alarm system (coordinate with other trades).

C. Unless otherwise indicated, smoke detectors integral to the smoke damper shall be furnished and installed by the fire alarm contractor (coordinate with other trades).

D. All smoke dampers shall be of the "Dynamic" type as classified in UL Standard 555S.

E. Maximum pressure drop: 0.10" wg; provide ductwork transitions as required so as not to exceed maximum pressure drop.

F. Leakage Rating: Class 1 (maximum of 8 cfm/ft^2 at 4 in. wg) unless noted otherwise.

G. Elevated Temperature Rating: 350°F (177°C) for 30 minutes.

H. Airflow Closure Rating:
   1. Dynamic smoke dampers shall be selected for the velocity and pressure rating of the intended installation. Refer to the plans and schedules for airflow rates (CFM) and pressures (in. wg).
   2. Dampers shall have a minimum velocity rating of 2000 fpm at a pressure rating of 4 in. wg.
   3. Dampers in systems operating above 2000 fpm or 4 in. wg shall be selected for a velocity rating of 4000 fpm at a pressure rating of 6 in. wg or a velocity rating of 6000 fpm at a pressure rating of 8 in. wg as required.

I. Types:
   1. Round: for use in systems up to 3000 fpm velocity.
      a. Construction:
         1) Frame: Galvanized steel (in gauges required by manufacturer's UL listing).
         2) Blade design: single double skin galvanized steel blade (in gauge required by manufacturer's UL listing).
         3) Retainer plate(s): supplied with damper.
         4) Sleeves: Length as required per wall thickness.
         5) Duct Transition Connection: breakaway type.
   2. Multi-blade:

a. Up to 2000 fpm velocity: Triple vee-groove type blade.
b. 2000-4000 fpm velocity: Fabricated double skin airfoil type blade.
c. Construction:
1) Frame: Galvanized steel with mitered and interlocking corners (in gauges required by manufacturer's UL listing).
2) Blade design: 16 ga. galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening.
3) Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than ½" of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.
4) Seals:
a. Blade Edge: Blade seals shall be extruded silicone rubber permanently bonded to the appropriate blade edges.
b. Jamb: Flexible stainless steel compression type.
5) Linkage: Concealed in jamb.
6) Axles: Minimum ½" diameter plated steel.
7) Bearings: Axle bearings shall be sintered bronze sleeve type rotating in polished extruded holes in the damper frame.
8) Sleeves: Damper shall be supplied as a single assembly with a factory sleeve.
9) Retaining Angles: Damper shall be supplied with factory retaining angles sized to provide installation overlap in accordance with the manufacturer's UL listing.
10) Duct Transition Connection: breakaway type

J. Damper Motors: Two-position meeting the following:
1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so the driven load will not require motor to operate in service factor range above 1.0.
b. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
c. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
d. 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).
e. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40°F (minus 40°C).
f. 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).
g. Electrical Connection: 115 V, single phase, 60 Hz.

K. Momentary Test Switch (for use in smoke dampers that are not part of a smoke management system): factory mounted and wired assembly for testing and cycling the damper during start-up and maintenance.

L. Accessories for active smoke management systems:
   1. Open Closed Indicator (OCI): factory mounted and tested with two switches, one set to close when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. This will be wired to the Fire Fighter's Smoke Control Station to indicate true damper position.
   2. Test Switch and Indicator Panel: 5" x 5" control panel with toggle switch, red LED (replaceable) indicator light to indicate closed damper position and a green LED (replaceable) indicator light to indicate open damper position.

2.06 CONTROL DAMPERS

A. Automatic control dampers shall be installed as shown on the drawings and shall be controlled as described in the 23 09 00 - Automatic Controls section of these specifications.

B. Unless indicated otherwise, dampers shall be of the opposed blade type constructed of minimum 18-gauge galvanized steel and shall have rigidly constructed blades less than 6" wide and shall have duct mounting flanges.

C. Dampers shall be the low leakage type with replaceable blade and jamb seals. Maximum pressure drop for dampers operating in systems exceeding 2000 fpm shall be 0.10" wg.

D. Outside air supply and exhaust openings shall be provided with a Class 1A motorized damper with a maximum leakage rate of 4 cfm/ft^2 (20.3 L/s · m^2) at 1.0 in. wg (249 Pa) when tested in accordance with AMCA 500D.
   1. Gravity (non-motorized) dampers having a maximum leakage rate of 20 cfm/ft^2 (101.6 L/s · m^2) at 1.0 in. wg (249 Pa) when tested in accordance with AMCA 500D may be used in any one of the following conditions:
      a. In buildings for exhaust and relief dampers.
      b. In buildings of less than three stories in height above grade.
      c. For ventilation air intakes and exhaust and relief dampers in buildings of any height in Climate Zones 1, 2 and 3.
      d. Where the design outdoor air intake or exhaust capacity does not exceed 300 cfm (141 L/s).

      Gravity (non-motorized) dampers for ventilation air intakes shall be protected from direct exposure to wind.
   2. Dampers smaller than 24 inches (610 mm) in either dimension shall be permitted to have a leakage rate of 40 cfm/ft2 (203.2 L/s · m2) at 1.0 in. wg (249 Pa) when tested in accordance with AMCA 500D.

2.07 FLEXIBLE DUCT CONNECTORS

A. Install flexible duct connectors at connections of sheet metal duct to motor driven equipment, or otherwise noted. Flexible duct connectors shall be glass fabric coated with neoprene, suitable for the intended service. Flexible duct connectors shall be Duro Dyne Excelon or approved equal. Install per manufacturer's instructions, and support sheet metal ductwork so that no weight is supported by the flexible duct connector.

B. Flexible connectors exposed to the weather shall be UV and ozone resistant.

C. Fabrics, coating and adhesives shall be tested in accordance with UL 701 and have a maximum flame spread/smoke developed rating of 25/50.

D. Flex duct connectors shall also be provided at building expansion joints.

2.08 ACCESS DOORS

A. Hinged, gasketed and latched access doors and/or panels shall be installed at each fire and smoke damper, each duct mounted smoke detector, each valve, at each duct mounted balancing damper or any other mechanical equipment or device that requires accessibility. Doors and panels shall be sized (minimum 18" x 18", duct size allowing), and located to optimize access to dampers, detectors, and other equipment for service and replacement. Access doors in ductwork shall be per SMACNA Standards. Access panels in walls, ceilings or other surfaces shall be coordinated with architectural finishes and selected by the architect.

B. Access doors shall be designed for five times the pressure of the duct in which it is mounted.

C. Access doors for fire dampers, combination fire/smoke dampers and smoke dampers in medium pressure (+4 in.wg and higher) duct systems shall be the implosion type designed to prevent excessive negative pressure downstream resulting in collapsed ductwork. At the contractor's option, the access door may be an integral feature of the damper assembly.

D. Access doors for grease exhaust ducts shall be in accordance with NFPA 96 (latest edition). Vertical grease ducts shall have an access door at each floor level in an inconspicuous location.

2.09 FLEXIBLE DUCTWORK

A. Flexible ductwork shall be UL Class 1 air duct.

B. Flexible ductwork shall be installed between main supply ducts and diffusers. Length shall be a maximum of 8'-0" long, except in residential applications, where the length shall be as indicated.

C. Flexible ductwork shall be Thermaflex M-KE R-6 (R value = 6.0 minimum or as required by local energy code) flexible air duct or approved equal. Duct size shall be the same size as the diffuser neck it serves.

D. Take-offs for sheet metal ductwork shall be made using a spin-in type fitting with air scoop and balancing damper.

E. Flexible duct connections to ceiling diffusers shall be installed without kinks or sags to provide unrestricted airflow. Provide Flex Flow Elbow supports by Thermaflex.

2.10 DUCT INSULATION

A. Also refer to Section 23 07 00 - HVAC Insulation.

B. Supply air ductwork a minimum of 15 linear feet (or as indicated) downstream of low pressure air handling equipment and terminal units shall be internally lined with 1½" thick acoustical

duct liner/insulation (minimum R-6 or greater where required by code) Johns Manville Linacoustic RC or approved equal.

1. Duct liner shall be securely fastened to ductwork with stick pins, speed washers and adhesive. Leading edges of liner in medium pressure ductwork shall have a sheetmetal nosing.
2. Exposed edges and butt joints shall be "buttered" with duct sealer.

C. Supply air ductwork a minimum of 50 linear feet (or as indicated) downstream of static pressure class +4 in. wg air handling equipment shall be internally lined with 1½" thick acoustical duct liner/insulation, (minimum R-6 or greater where required by code) Johns Manville Linacoustic RC or approved equal.

D. Return air ductwork, sound boots and transfer ducts shall have 1" thick liner, Johns Manville Linacoustic RC or approved equal.

1. Refer to Section 23 07 00 - HVAC Insulation for return air ductwork requiring external insulation.

E. Round duct liner shall be 1" thick fiberglass duct liner/insulation (minimum R-4 or greater where required by code) Johns Manville Spiracoustic Plus or approved equal.

PART 3 - EXECUTION

3.01 DUCTWORK

A. All ductwork shall be installed in accordance with applicable SMACNA Standards according to the pressure class described in PART 1 - GENERAL.

B. Ductwork shall be supported as recommended by SMACNA Standards from structural members. Ductwork shall not be allowed to rest on ceilings, light fixtures or structural members. Ductwork supported from joists shall be supported from the top chord of all joists.

C. All ductwork accessories shall be installed in strict accordance with manufacturer's recommendations.

D. Ductwork that is designed to operate at static pressures in excess of 3 in. wg and all ductwork located outdoors shall be leak-tested in accordance with SMACNA Standards. Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. All sections shall be selected by the building owner or the designated representative of the building owner. Positive pressure leakage testing is acceptable for negative pressure ductwork. The maximum permitted duct leakage shall be:

$$L_{max} = C_L P^{0.65}$$

where

L_{max} = maximum permitted leakage, cfm/100 ft^2 duct surface area
C_L = 6, duct leakage class, cfm/100 ft^2 duct surface area at 1 in. wg
P = test pressure, which shall be equal to the design duct pressure class rating, in. wg

All ductwork seams shall be sealed with mastic to provide a system that is within the recommended SMACNA leakage limits. Six (6) copies of the ductwork test report shall be submitted to the Engineer prior to the Contractor's request for final payment.

E. All ductwork shall be cleaned inside and out prior to system start up, and shall be left in a neat and orderly manner.

F. Duct sizes shown on drawings are inside clear dimensions.

G. Unless otherwise approved, ducts shall be true to dimensions indicated, straight and smooth on the inside with neatly finished joints, securely anchored to the building in an approved manner, and installed to be completely free from vibration under all conditions of operation. Exact routing of ductwork will be dependent on location of framing members. Route ductwork to avoid cutting framing members.

H. Brace ducts not more than 60 inches on center.

I. Make slip joints in the direction of air flow.

J. Offset ducts around obstructions where possible. Where duct must encompass obstruction, area of duct shall remain constant.

K. Duct tapers shall not exceed 1:4 ratio and transformations 30 degrees between air flow and diverging or converging air flow.

L. Provide access doors for access to all equipment, dampers and motors concealed by sheet metal.

M. Where applicable, provide seismic bracing and restraints for ductwork per ASCE 7-10 and the latest edition of the SMACNA Seismic Restraint Manual. Also refer to Section 23 05 48 Noise and Vibration Control.

3.02 BALANCING DAMPERS

A. Install manual volume dampers where indicated on the drawings and where required to properly balance the air distribution system.

B. Provide an opposed blade damper behind the face of each supply register which shall be adjustable through the face of the register with a screwdriver.

C. Provide a butterfly damper in the neck of each supply diffuser unless noted otherwise.

END OF SECTION 23 31 00

SECTION 23 34 00 - UNITARY EXHAUST, SUPPLY FANS AND VENTILATORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Refer to specification section 23 00 00 - HVAC General, all of which applies to work described in this section as if written in full herein.

B. Furnish and install all unitary exhaust and supply fans and ventilators of the size, type, capacity and characteristics as shown on the equipment schedules and herein described.

C. Acceptable manufacturers include only those whose products have been in satisfactory use in similar service for not less than five (5) years.

D. Electrical Standards: Provide electrical motors and products which have been listed and labeled by Underwriters Laboratories Inc. and comply with NEMA Standards.

E. Certification, Fan Performance: Provide fans whose performance is certified by AMCA under the specified conditions.

PART 2 - PRODUCTS

2.01 CENTRIFUGAL AND AXIAL FANS AND VENTILATORS

A. All units shall be rigidly constructed of materials suitable for the intended service and shall be installed with all accessories listed on the Drawings.

B. All roof mounted units shall be installed on factory supplied 12-inch high (minimum) insulated roof curbs of the proper type, size and construction for proper mounting. Curbs shall account for all roof slopes and pitches so that the unit is installed level. Units shall be anchored to curbs by a minimum of two lag screws of adequate size on each side. Curbs shall be constructed of galvanized steel, except when the project is located within 5 miles of a sea coast they shall be of aluminum construction.

C. Outdoor fans shall be completely weatherproof for outdoor installation and shall contain internal vibration isolation to assure smooth and quiet performance.

D. Fan wheels and blades shall be constructed of aluminum and shall be statically and dynamically balanced at the factory.

2.02 EXHAUST FANS SERVING KITCHEN HOODS

A. Grease handling exhaust fans shall carry a UL 762 Listing and shall be provided with all accessories/features required to meet that listing.

B. Grease exhaust fans shall discharge a minimum of 42" above the finished roof.

2.03 EXHAUST FANS SERVING DISHWASHERS

A. Dishwasher exhaust fans shall be all aluminum construction.

2.04 CEILING-CENTRIFUGAL AND CABINET FANS

A. Units shall be direct-drive type with back-draft damper, acoustically insulated cabinets and speed controller.

PART 3 - EXECUTION

3.01 GENERAL

A. All units shall be installed in accordance with manufacturer's recommendations and as shown on the Drawings.

B. Ceiling-centrifugal and cabinet fans shall be supported from structural members and shall not rest on the ceiling, on lights or on structural members.

C. Units shall be interlocked and controlled as indicated on the Drawings.

D. Ceiling-mounted units shall be installed with ceiling grilles flush with the ceiling.

E. Curb-mounted fans shall be secured to the roof curb with lag screws in each hole in the fan curb cap.

F. Electrical connection to the fan motor shall be made through the roof opening inside the roof curb.

END OF SECTION 23 34 00

SECTION 23 37 00 - LOUVERS, GRILLES, REGISTERS AND DIFFUSERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install all louvers, grilles, registers and diffusers of the size, type, capacity, and characteristics as shown on the equipment schedules and described herein.

B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

PART 2 - PRODUCTS

2.01 LOUVERS

A. Louver components (heads, jambs, sills, blades, etc.) shall be factory assembled by the manufacturer into a complete unit. Louver sizes too large for shipping shall be built-up by the Contractor from factory assembled louver sections to provide the overall sizes required.

B. Louver design shall incorporate structural supports required to withstand a wind load of 20 lbs. per square foot.

C. All louver performance data submitted for approval shall bear the AMCA Certified Ratings Seal for Air Performance and Water Penetration.

D. All louvers shall have a standard factory applied finish coating with color selection made by the Architect at the time of shop drawing approval. Color charts shall be submitted with louver shop drawings.

2.02 GRILLES, REGISTERS AND DIFFUSERS

A. Units shall be of the type, size, and construction as scheduled on the Drawings.

B. Unless otherwise noted on the Drawings, all units shall be supplied with a factory finish of white baked enamel.

C. Grilles, registers and diffusers shall be ordered with borders compatible with the ceiling system type in which they are installed.

D. Aluminum devices shall be used for all areas subject to excessive moisture or humidity (e.g. showers, pools, bathrooms, etc.).

PART 3 - EXECUTION

3.01 LOUVERS

A. Louvers shall be installed according to manufacturer's recommendations, and shall be caulked and sealed at the frame and flanges to make the installation weatherproof.

B. Combination louver dampers shall be installed with required damper operators and linkage mechanisms and shall be field adjusted for full opening/closure stroke. Louvers shall be interlocked as indicated on the Drawings.

3.02 GRILLES, REGISTERS AND DIFFUSERS

A. All units located in ceiling tiles shall be centered or shall be on quarter points of 2 ft. x 2 ft. tiles.

B. Where a line of sight allows the ductwork, wall or ceiling structure to be seen behind any units, such ductwork, wall or ceiling structure shall be painted with nonflammable flat black paint to minimize visibility.

C. All units not installed on T-bar ceiling grids shall be securely fastened to adjacent structures.

D. Where air distribution devices are installed in inaccessible ceilings, provide spin-in with scoop without volume damper. Provide opposed blade damper in neck of air distribution device with access to damper control through face.

END OF SECTION 23 37 00

SECTION 23 81 26 - SPLIT SYSTEM AIR CONDITIONERS (<65,000 Btu/hr.)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install direct expansion air cooled split systems of the size and capacity shown on the equipment schedules.

B. Outdoor units shall be factory matched with air handling units for compatibility and shall be rated in accordance with AHRI Standard 210/240.

C. Equipment schedules and specifications are intended to establish a minimum level of quality and workmanship for the project. When other than the basis of design equipment is proposed, the Contractor shall be responsible for all costs associated with engineering and construction modifications necessary in his or any other trade that may be required to satisfy the Contract Documents.

D. Refer to the drawings for basis of design manufacturer and acceptable alternates.

PART 2 - PRODUCTS

2.01 OUTDOOR UNIT

A. Outdoor units shall be complete, including cabinet, hermetic compressor, nonferrous condenser coil with guard, condenser fan and motor, refrigerant reservoir or receiver, charging valve, controls, refrigerant holding charge, heavy duty permanently lubricated motors with built-in thermal overload protection, locked rotor, over and under voltage protection, high pressure cutout with auto-reset, motor starters and contactors, compressor protection, crankcase heater, transformer, filter/drier, vibration isolation, and other required components. Casings shall be constructed of zinc-coated steel, double phosphatized and finished with baked enamel for positive weatherproof protection. Removable panels shall provide access to all components from one side of the unit. Drain holes shall be provided in the base for positive drainage. Compressor shall be capable of operation down to 55°F ambient and shall have a 5-year warranty.

2.02 INDOOR UNIT

A. Air handling evaporator unit shall be complete, including cabinet, nonferrous DX cooling coil, centrifugal fan(s), drives, permanently lubricated multi-tap motor with thermal overload protection, filter track with 1" thick disposable filter(s) (minimum MERV 6 or as scheduled), expansion valve, solenoid valve, R-410A refrigerant charge, insulated galvanized drain pan and other required components. Casings shall be constructed of zinc coated heavy gauge steel painted with baked-on enamel and internally insulated with R-4.2 fiber material.

2.03 ACCESSORIES

A. Support feet.

B. Field installed electric heater package with single point power connection, thermal overload, control transformer and disconnecting means.

PART 3 - EXECUTION

3.01 GENERAL

A. Units shall be installed as shown on the Drawings and in strict accordance with manufacturer's recommendations.

B. Refer to the drawings for roof mounting details. Secure condensing unit to equipment support.

C. Condensing units shall be installed level.

D. Units shall be installed to allow adequate service to all components.

END OF SECTION 23 81 26

SECTION 23 81 28.13 - DUCTLESS SPLIT SYSTEM HEAT PUMPS (1 to 3½ TONS)

PART 1 - GENERAL

1.01 DESCRIPTION

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 23 00 00 - HVAC General.

B. Furnish and install direct expansion air-to-air split system heat pump units of the size and capacity shown on the equipment schedule. The unit shall be completely factory assembled and tested, and shall include variable speed compressor, indoor and outdoor coils, fan motors, wired and wall mounted controller, interconnecting refrigerant tubing, and power and control wiring. The outdoor unit shall be of the inverter driven design and factory matched with the indoor unit.

C. Equipment schedules and specifications are intended to establish a minimum level of quality and workmanship for the project. When other than the basis of design equipment is proposed, the Contractor shall be responsible for all costs associated with engineering and construction modifications necessary in his or any other trade that may be required to satisfy the Contract Documents.

D. Refer to the drawings for basis of design manufacturer and acceptable alternates.

1.02 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210/240 and bear the AHRI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001.

E. A dry air holding charge shall be provided in the indoor section.

F. System efficiency shall meet or exceed the scheduled values.

G. Delivery, Storage and Handling:

1. Equipment shall be stored and handled according to the manufacturer's recommendations.
2. The controller shall be able to withstand storage temperature of 105°F and 95% relative humidity without any adverse effects.

1.03 SUBMITTALS

A. Product Data: Include performance data (including extended capacity ratings if other than AHRI standard conditions are scheduled), operating characteristics, furnished specialties, and accessories.

1.04 COORDINATION

A. Coordinate size, weight and location with Architectural and Structural drawings. Where concrete pads are indicated, conform to Division 03 for concrete, reinforcement, and formwork requirements.

1.05 WARRANTY

A. The indoor and outdoor units shall carry a manufacturer's standard parts and defects warranty for a period five (5) years from the date of installation. The compressor shall carry a warranty of seven (7) years from the same date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

PART 2 - PRODUCTS

2.01 INDOOR UNITS

A. The indoor units shall be following types: wall mount, ceiling recessed cassette, ceiling suspended and horizontal ducted. All indoor units shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board, fan and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function after power interruption. Indoor unit shall be purged with dry air before shipment from factory.

B. Wall Mount Type:

1. Unit Cabinet:
   a. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white.
   b. A separate metal installation plate that secures the indoor unit firmly to the wall shall be furnished with the unit. The installation plate shall be securely attached to the wall using an appropriate anchoring method for the wall type the unit will be attached to.
2. Fan:
   a. The fan shall be a high performance direct drive double inlet forward curved sirocco type design driven by a single motor. The fan shall be statically and dynamically balanced and be powered by a motor with permanently lubricated bearings.
   b. The fan shall have three (3) speeds: Low, Mid, High and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

3. Directional Air Flow Vane: An integral, motorized multi-position vane shall automatically direct air flow in a horizontal and downward direction to provide uniform air distribution.
4. Filter: Return air shall be filtered by means of an easily removable washable filter.
5. Coil:
    a. The indoor unit coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow.
    b. All tube joints shall be brazed with PhosCopper or silver alloy.
    c. The coils shall be pressure tested at the factory.
    d. A condensate pan and drain shall be provided under the coil.
    e. Condensate overflow protection: a drain pan water level switch, designed to connect to the control board and shut the unit off, shall be provided when scheduled.
    f. A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available.

C. Ceiling Recessed Cassette Type:

1. Unit Cabinet:
    a. The cabinet shall be formed from galvanized sheet metal coated with high-density foam insulation. The cabinet shall be designed for recessed mounting and provided with four (4) corner mounting supports behind removable corner pockets located in the grille assembly allowing adjustment of mounting height from the front of the unit.
    b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
    c. The cabinet shall have a knock-out for the connection of a branch supply air duct to condition a secondary space.
    d. The cabinet shall have an optional multi-function casement which will mount between the unit cabinet and the Grille assembly to provide a second field installed filtered outside air intake and provide a mount for a high-efficiency filter element.
    e. A separate grille assembly shall be attached to the front of the cabinet with supply air vanes to supply air in four directions. The four-way grill shall allow two, three or four-way blow. The grille vane angles shall be individually adjustable from the wired remote controller. The return air intake shall be located in the center section of the grille. The grille assembly shall be white.
2. Fan:
    a. The fan shall be a direct drive turbo propeller design driven by a single motor. The fan shall be statically and dynamically balanced and be powered by a motor with permanently lubricated bearings.
    b. The fan shall have four (4) speeds: Low, Mid1, Mid2, High and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

3. Directional Air Flow Vane: An integral, motorized multi-position vane shall automatically direct air flow in a horizontal and downward direction to provide uniform air distribution.
4. Filter:
   a. Return air shall be filtered by means of an easily removable washable filter.
5. Coil:
   a. The indoor unit coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow.
   b. All tube joints shall be brazed with PhosCopper or silver alloy.
   c. The coils shall be pressure tested at the factory.
   d. A condensate pan and drain shall be provided under the coil.
   e. Condensate overflow protection: a drain pan water level switch, designed to connect to the control board and shut the unit off, shall be provided when scheduled.
   f. A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available. A condensate pump is not required or desired in the electrical or telecom rooms.

2.02 OUTDOOR UNIT

A. General:

1. The outdoor unit shall be specifically designed and matched to operate with the indoor unit. The outdoor unit shall be completely factory assembled, piped and wired and run tested at the factory.
2. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.
3. The unit shall be capable of cooling operation down to 23°F (-5°C) ambient temperature without additional low ambient controls (an optional wind baffle shall be required for cooling operation down to 0°F (-17.7°C). Heating shall be available between 17°F (-8°C) and 70°F (21°C) ambient without any additional controls or accessories.
4. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between the indoor and outdoor units.
5. System shall be capable of operation up to a maximum refrigerant tubing length of 100 feet (30 meters) for the 1 and 1½ ton units and 165 feet (50 meters) for the 2 thru 3½ ton units between indoor and outdoor units without the need for line size changes, traps or additional oil.

B. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.
2. Serviceable parts shall be accessible by means of removable panel sections.
3. Cabinet color shall be the manufacturer's standard color.

4. The unit shall have two (2) mild steel mounting feet, transversely mounted and welded to the cabinet base pan. The mounting feet shall have a slotted mounting hole at each end for a total of four (4) mounting holes. The cabinet assembly shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas.

C. Fan:

1. The unit shall be furnished with single or dual direct drive fan wheels.
2. The fan motor shall be a direct current (DC) motor with permanently lubricated bearings.
3. The fan motor shall be mounted for quiet operation.
4. The unit shall be provided with a raised fan safety guard to prevent contact with moving parts.
5. The outdoor unit shall have horizontal discharge airflow.

D. Coil:

1. The L shaped condenser coil shall be constructed of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.
2. Refrigerant flow from the outdoor unit shall be regulated by means of an electronic linear expansion valve (LEV) metering device.
3. The outdoor unit shall be pre-charged with sufficient R-410a refrigerant to accommodate up to twenty-five (25) feet of refrigerant piping for capacities up to 18,000 btu/hr., and up to thirty-three (33) feet of refrigerant piping for capacities above 18,000 btu/hr.
4. Refrigerant linesets between the outdoor and indoor units shall be annealed refrigeration grade copper tubing, Type ACR, meeting ASTM B280 requirements. The lines shall be individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with a thermal conductivity equal to or better than 0.27 BTU-inch/hour per ft^2/°F and a water vapor transmission equal to or better than 0.08 Perm-inch. Insulation thickness shall be as required to satisfy project specific energy code requirements (refer to Section 23 23 00 Refrigerant Piping for additional information). Insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN/ULC S-102.
5. Refrigerant piping connections between the outdoor and indoor units shall be flare type.

E. Compressor:

1. The compressor shall be the high performance, hermetic, inverter driven, variable speed, dual rotary type.
2. The compressor motor shall be the direct current (DC) type equipped with a factory installed inverter drive package.
3. The outdoor unit shall be equipped with an accumulator and high pressure safety switch.
4. The compressor shall be equipped with internal thermal overload protection.

5. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater will be required.
6. There shall be no need for line size changes. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
7. The compressor shall be mounted to reduce vibration transmission.

F. Electrical:

1. The unit electrical characteristics shall be 208/230 volts, 1-phase, 60 hertz and shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.
2. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have a Pulse Amplitude Modulation circuit to utilize 98% of the input power supply.

2.03 CONTROLS

A. General:

1. The system shall have either a wired and wall mounted controller as scheduled to perform input functions necessary to operate the system.
2. The controllers shall have a Power On/Off switch, Mode Selector – Auto, Cool, Heat, Dry Modes - Temperature Setting, Timer Control with Clock, Fan Speed Select and Vane / Airflow Direction selector. Controllers shall have a programmable Smart Set button for pre-selected Temperature, Fan Speed, and Vane position settings.
3. The controller shall support multiple languages (Spanish, German, Japanese, Chinese, English, Russian, Italian, or French) for display information.
4. The indoor unit shall be capable of performing self-diagnostic functions and check mode switching.
5. Temperature changes shall be displayed in 1ºF (1ºC) increments with a range of 61 - 88ºF (16-31ºC).
6. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless or a wired controller, providing emergency operation and controlling the outdoor unit.
7. The system shall be capable of automatically restarting and operating at the previously selected conditions when the power is restored after power interruption.
8. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off, System/Mode function.
9. Controller:
    a. Wired wall mounted remote controller: The wired remote controller shall be furnished with a communications interface to communicate with the indoor unit. The interface will be mounted at the indoor unit.
    The wired remote controller shall have a light-green LCD display. There shall be a built-in weekly timer with up to 8 pattern settings per day. The

controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor.

2.04 ACCESSORIES

A. Wind Guard/Baffle: if specified or if required to achieve proper operation due to high wind conditions and/or low ambient operation.

B. Wall mounting bracket (if specified): factory fabricated painted steel bracket to accept outdoor unit mounting holes, secure to wall and provide manufacturer recommended airflow and maintenance clearances.

C. Air outlet guide: provide where multiple units are arranged for series airflow at less than manufacturer's recommended airflow clearance.

D. Outdoor drain pan with drain connection: provide where outdoor units are subject to defrost and located in an area where melting ice could pose a nuisance/safety issue. Extend drain piping to a safe area.

E. Condensate pump: provide where noted or schedule for when condensate drain piping cannot be installed to achieve gravity flow. Do not install a condensate pump for the units serving the electrical and telecom rooms. The condensate piping for those units shall gravity drain.

PART 3 - EXECUTION

3.01 GENERAL

A. Units shall be installed as indicated and in strict accordance with manufacturer's recommendations and installation instructions.

B. Units shall be installed level.

C. Test for positive condensate drainage.

D. Units shall be installed to allow adequate service to all components.

END OF SECTION 23 81 28.13

SECTION 23 82 39 - ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 23 00 00 - HVAC General.

1.02 WORK INCLUDED

A. Receipt, unloading, handling, proper storage and protection from damage of all materials.

B. Layout and coordination of work with other trades.

C. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install electric unit heaters complete as indicated on the Drawings and as specified herein.

PART 2 - PRODUCTS

2.01 UNIT HEATERS

A. Unit shall be of the horizontal or vertical blow-thru propeller fan type.

B. Casing shall be constructed of 18-gauge die-formed, furniture grade steel, phosphate coated and finished in baked enamel.

C. Electric heating element shall be a resistant wire enclosed in a steel sheath with fins.

D. Fan shall be direct drive, propeller type, designed for unit heater application.

E. Motor shall be totally enclosed, thermally protected continuous duty selected to match fan requirements.

F. Unit shall be provided with the manufacturer's standard mounting bracket for either ceiling or wall mounting as required.

G. Unit shall be equipped with individual adjustable louvers.

H. Wiring of unit heater shall be designed for a single source power connection with elements, motor and control circuits subdivided and fused to conform to the latest National Electrical Code, OSHA and Underwriters Laboratories Inc. standards. All three phase heaters shall have balanced phases. A non-fused disconnect switch factory wired shall be provided. Control circuit voltage shall not exceed 120 volts.

I. Unit heater shall be equipped with an automatic reset linear thermal cut-out, a fan delay switch, control circuit transformer and either a wall mounted or unit mounted thermostat as shown on the Drawings.

J. Units shall be Q-Mark, Markel, Trane, Modine or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All units shall be installed in strict accordance with the manufacturer's recommendations.

END OF SECTION 23 82 39

SECTION 26 00 00 - ELECTRICAL GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.

B. The scope of work to be done under this section of the specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of systems for power, lighting, signals and all other work indicated on the drawings or as specified herein. A 100% operational building and electrical distribution system up to a connection point for Owner furnished equipment will be provided.

C. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both.

1.02 STANDARDS

A. All work shall conform to all ordinances and regulations of the San Marcos, USA, Texas and/or other authorities having jurisdiction in accordance with the requirements of the following codes, standards and design guides:

1. The 2014 edition of the National Electrical Code (NFPA 70) with Local Amendments.
2. The 2012 edition of the International Building Code with Local Amendments
3. The 2012 edition of the International Fire Code with Local Amendments
4. The Life Safety Code (NFPA 101)
5. The National Electrical Safety Code (ANSI C-2)
6. Regulations of the local utility company with respect to metering and service entrance
7. Local city and county ordinances governing electrical work
8. Americans with Disabilities Act (Public Law 101-336)
9. The 2009 International Energy Conservation Code

1.03 PERMITS

A. The Contractor shall obtain all permits and inspections required for the installation of this work and pay all charges incident thereto. He shall deliver to the Architect all certificates of said inspection.

1.04 WORK INCLUDED

The electrical systems installed and work performed under this division of the specifications shall include but not necessarily be limited to those listed below. All materials and appliances, obviously a part of the electrical systems and necessary to its proper operation, but not specifically mentioned or shown on the drawings, shall be furnished and installed without additional charge.

A. Power Distribution System

B. All lighting systems (indoor and outdoor, normal, emergency and exit) including all fixtures, lamps, plaster and/or tile frames, standards, switches, outlets, wiring, dimmers, contactors, time clocks, photocells, batteries, raceways and other components and fittings required for complete lighting systems

C. Wiring, including power circuit connections for HVAC, plumbing and other mechanical equipment

D. Grounding Systems

E. Temporary service lighting and power system

F. Low voltage system raceways and equipment mounting boards as indicated on the drawings

G. Underground raceway excavation, backfill, and compaction

H. Fire Alarm System

I. Concrete work for duct banks, manholes, covering, lighting standard bases and equipment bases (where not assigned to General Contractor)

J. Lightning Protection System

K. Electrical Equipment Identification

L. Supporting Devices for Electrical Components

M. Work as required by electric and telecommunication utilities, as well as the coordination of additional work (i.e. work performed by the utility) with that of other trades

1.05 DRAWINGS

A. Drawings are generally diagrammatic and show the arrangement and location of fixtures, equipment and conduit. The Contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to rearrange conduit or equipment, the Contractor shall so advise the Engineer and secure approval before proceeding with such work.

B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

D. Locate pull boxes, panelboards, control pushbuttons, terminal cabinets, safety switches and such other apparatus as may require periodic maintenance, operation, or inspection, so that they are easily accessible. If such items are shown on the plans in locations which are found to be inaccessible, the Engineer must be advised of the situation before work is advanced to the point where extra costs will be involved.

E. All additional circuit connections to panelboards must be preapproved by the Engineer.

F. The location, arrangement and extent of equipment, devices, conduit, and other appurtenances related to the installation of electrical work shown on drawings are approximate. The Contractor shall not scale drawings, but shall refer to the architectural drawings for exact dimensions of building components. Should a conflict exist between the architectural and engineering drawings regarding dimensions and scale, the Contractor shall notify the Architect of the discrepancy.

G. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering lighting fixtures. Notify the Engineer of any discrepancies.

H. Review all architectural drawings for door swings, cabinets, counters and built-in equipment.

1.06 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare a minimum of two (2) instruction manuals, one of which shall be submitted to the Architect for the Engineer's review, describing installation, operation and maintenance of all Electrical equipment. Manuals shall include copies of control schematics, sequences of operation, indicate the function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturer's drawings, pamphlets, data, parts lists, and instruction manual for each piece of equipment. Upon approval, one copy shall be delivered to the Owner; one copy shall be kept by the Contractor. The pamphlets and drawings are to be neatly bound in a 3-ring binder(s).

1.07 AS-BUILT DRAWINGS

A. The Contractor shall maintain a record of all changes in the work from that shown in the Contract Documents. After all work is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the Contract Drawings that reflect all changes and that accurately show actual final construction, and deliver these drawings to the Architect.

1.08 EQUIPMENT, MATERIALS AND BID BASIS

A. Manufacturers' names, model numbers, etc. as specified on the drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.

B. Unless "approved equal" is specifically stated, bids shall be based on equipment names in specifications or on drawings as "base" products.

C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be substantially equal in size, weight, construction and capacities. The "equal" equipment and materials shall be submitted as full equivalent to the equipment and materials specified,

with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. Submittals for "equal" products shall be made at least ten (10) days prior to bid (refer to the General Conditions of these specifications). The Engineer shall consider the use of the "equal" equipment based on the supportive documentation available to him, and shall approve or disapprove any proposed alternates. The decision of the Engineer shall, in all cases, be final.

D. The Contractor shall coordinate the installation of all electrical equipment proposed for use in this project with all building trades (architectural, structural, mechanical, etc.). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval.

When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy the plans and specifications.

E. If substitutions are made in lieu of equipment specified, the manufacturer's literature shall be submitted to the Engineer for approval. In the case of lighting fixtures, full IES photometric test reports for the fixture, lamp(s), and lenses shall be submitted for approval.

1.09 SUBMITTALS

A. The Contractor shall prepare, submit, and obtain Engineer's review of manufacturers' submittals on the following equipment and systems prior to ordering, purchasing, or installation of any equipment or materials. All required submittals shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review.

1. Submit a listing of all the materials indicated below, with the type of material, manufacturer and catalog or model number for each (where applicable):

<u>Package #1</u>
Conductors
Conduit
Wiring Devices and Plates
Disconnect Switches
Time Switches
Photocells
Lighting Contactors

2. Submit complete shop drawings of the following when supplied by the electrical contractor:

<u>Package #2</u>
Fuses and/or Circuit Breakers
Short Circuit and Coordination Study
Surge Protective Devices
Panelboards and Cabinets

<u>Package #3</u>
Lighting Fixtures
Occupancy Sensors
Lighting Control Panels

Package #4
Generator Set
Transfer Switch

Package #5
Fire Alarm System

Package #6
Lightning Protection

3. Submit test reports as required in section 3.07 - Electrical Testing.

B. All shop drawing approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.

C. Review of shop drawings by the Engineer does not relieve the Contractor from responsibility for complying with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements (roof penetrations, wall penetrations, floor penetrations, curbs, electrical, etc.) of all approved equipment with the other trades and disciplines at no additional cost.

D. All shop drawings shall be identified by the equipment mark or tag identification numbers shown on the Contract Drawings. Each individual submittal item shall be marked to show which specification section pertains to the item.

1.10 COORDINATION OF TRADES

A. The Contractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

B. Work shall not be performed without first coordinating the installation of same with other trades. The Contractor, at his own expense, shall relocate all uncoordinated equipment installed should they interfere with the proper installation and mounting of mechanical equipment, ceilings and other architectural or structural finishes.

C. The Contractor shall coordinate the elevations of all equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.

D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, the Contractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.

E. The Contractor shall confirm that work installed under this section does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract Documents.

F. Work that is installed under this Contract which interferes with the architectural design or building structure shall be removed and relocated as required at no additional cost to the Contract.

1.11 WARRANTY

A. All equipment furnished and installed under this Contract shall be provided with the manufacturer's standard warranty unless otherwise noted.

B. The Contractor shall make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

1.12 TEMPORARY LIGHT AND POWER

A. The Contractor shall provide a temporary service of the amperage and voltage required by the Project Manager.

B. Sufficient wiring, outlets and lamps shall be installed to ensure proper lighting in accordance with OSHA, state and municipal codes. Refer to Division 1 specifications for requirements.

1.13 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Review all specification sections and drawings including mechanical, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.

B. Prior to installing material such as electrical equipment, devices, feeders, or branch circuits serving equipment of all other trades, the Contractor shall coordinate with the electrical requirements of the equipment to be installed.

1.14 MECHANICAL SYSTEMS COORDINATION

A. All control wiring for mechanical systems shall be installed under Division 23.

B. Motor controllers (starters) shall be furnished under Division 23 and installed under Division 26, unless specified otherwise.

C. Power wiring to all motors and motor controllers and between motors and controllers shall be provided in Division 26.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All equipment, materials, accessories, etc. used shall be new and of current production unless specified otherwise. Equipment not specified in the Contract Documents shall be suitable for the intended use and shall be subject to approval by the Engineer.

B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.

C. All equipment shall bear the inspection label of Underwriters Laboratories Inc.

D. All equipment and material for similar applications or systems shall be provided from the same manufacturer unless noted otherwise.

E. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.

2.02 IDENTIFICATION

A. Equipment or devices specified in the individual sections to be identified shall be identified by machine cut stencil unless the equipment is identified by the manufacturer. Identification of flush mounted cabinets and panelboards shall be on the inside of the device. Surface mounted equipment shall be identified on the outside cover. Equipment operating on 208Y/120 volt system shall be identified with black labels with white inner core.

B. All switchboards and panelboards supplied by a feeder shall be stencil-labeled to indicate the equipment where the power supply originates.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Mounting heights, unless otherwise noted, are to be center line of the equipment and/or device except the mounting height of suspended light fixtures which is to the bottom of fixture.

B. All work shall be designed and installed to comply with the requirements for the seismic design category and use group for the area in which the building is constructed.

3.02 EXCAVATION, TRENCHING & BACKFILLING

A. Contractor shall call underground utilities locator company before digging.

B. Barricades shall be provided around open holes and trenches. Temporary bridges shall be provided over trenches cut through major sidewalk routes. Major sidewalk routes shall not be closed to pedestrian traffic.

C. Barriers shall be provided to protect landscaping adjacent to the excavation area.

D. When rocks, concrete or other debris are encountered during excavation, remove completely.

E. Where sidewalk sections must be removed for installation of underground ducts, remove the sidewalk sections completely from joint to joint.

F. Where asphalt must be removed for installation of underground ducts, saw cut the asphalt in two, straight, parallel lines.

G. Backfill excavations in 6-inch layers and mechanically compact to 98 percent compaction.

H. Excavated materials may be used as backfill only if the backfill is sand or clean dirt that is free of rocks and debris over 3/4" in diameter.

I. In landscaped areas, backfill and mechanically compact to a depth of 6 inches below grade.

J. Backfill the last 6 inches with clean topsoil. Reseed lawn areas.

K. Restore concrete sidewalks and asphalt.

L. The Contractor shall perform all excavation to install the work herein specified and as indicated on drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and others excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done except under pavement.

M. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, and tamped. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.

N. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and tamped until the crown of the pipe is covered by a minimum of 6" of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 98% of the maximum density as determined by the Standard Proctor Test.

   Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off. A metallic lined underground warning tape shall be provided 12" below finished grade. The tape shall be red for electrical lines and orange for telephone and shall be identified as to the type of line.

O. Perform excavation and backfilling work in accordance with applicable portions of the earthwork section.

3.03 STORAGE AND PROTECTION OF MATERIALS

A. Refer to the general requirements section of the specifications, Division 1, for storage, protection, and handling requirements.

B. Inspect materials upon arrival at project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material.

C. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact.

D. Containers which are broken, opened, watermarked, or otherwise damaged materials are unacceptable and shall be removed from premises.

E. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

3.04 CONCRETE WORK

A. Construct curbs, pads, vaults and similar supports for electrical equipment where required.

B. Provide 4" thickness housekeeping pads at floor mounted equipment, covering entire area occupied by equipment. Dowel pads to structural slab.

C. Perform concrete work in accordance with applicable portions of Concrete sections. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

3.05 PAINTING

A. Except as otherwise specified, painting shall be accomplished under Painting Section. Surfaces shall be left clean of debris and free from oil and other substances which would prevent paint bond.

B. Touch up finishes of factory painted apparatus where finish is marred during installation.

C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.

D. Do not paint over nameplates on equipment, nonferrous hardware, accessories or trim.

3.06 WORKMANSHIP

A. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components.

3.07 ELECTRICAL TESTING

A. Furnish all labor, materials, instruments, supplies, and services and bear all costs for the accomplishment of the tests herein specified or requested at job site. Correct all defects appearing under test, and repeat the tests until no defects are disclosed, leave the equipment clean and ready for use.

B. All grounds, crosses, shorts, etc., must be eliminated from the wiring. Test all lighting fixtures, together with switches and controls; test the operation of all motors, controllers, and other electrical equipment devices.

C. The Contractor shall perform any tests other than herein specified which may be required by the Engineer or the authority having jurisdiction.

D. Perform the following tests after installation but before energizing the equipment. The following tests and procedures apply to all equipment and material that is to be tested under this Contract.
   1. Ground Resistance
      a. Visually inspect for specified ground connections.
      b. Perform ground resistance test at all connections to switchboards and panelboards.
      c. Use three point or fall of potential method.
      d. Verify single point connection (at the counterpoise) between the grounded and grounding systems.
      e. Additional ground rod is required if resistance is greater than 25 ohms.
   2. Panelboards
      a. Visually inspect all components for damage.
      b. Check operation of circuit breakers/fusible switches.
   3. Ground Fault Systems
      a. Visually inspect for damage and improper connections.
   4. Transfer and Other Relay Schemes
      a. Investigate intended function, and verify correct operation.

E. The Engineer shall be notified immediately of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.

F. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to meet the specified requirements.

3.08 TRAINING

A. Upon completion of the work, the Contractor shall conduct operation and training session(s) for the Owner's key personnel. These sessions shall be of sufficient length and duration to adequately explain the design intent and proper operating and maintenance techniques for all equipment and systems. After these sessions are completed, the Contractor shall provide a copy of a signed statement by the Owner that his personnel are thoroughly familiar with and capable of operating all equipment and systems.

END OF SECTION 26 00 00

SECTION 26 05 19 - CONDUCTORS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

1.02 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install conductors, complete, as indicated on the Drawings and as specified herein. Provide a complete system of wiring with all feeders and branch circuits as shown on the Drawings. The wiring system shall be complete to each and every outlet and apparatus shown on the Drawings which requires electrical connections.

B. This section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 600 volts or less.

1.03 COLOR CODING

A. Color coding shall be as follows:

120/208 Volt System
Phase A –Black
Phase B – Red
Phase C – Blue
Neutral – White
Ground – Green
Isolated Ground - Green with yellow strip (where applicable)

(Verify color-coding with local code Authority and use local code requirements if and only if the above color code is not acceptable to local authority.)

B. All wire shall be color coded throughout its entire length. Colored phase tape is not allowed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Wire shall be Southwire/SIMpullTM, Pirelli, Rome, General Cable, Senator, United Copper Industries, Alcan, AFC, or approved equal.

2.02 CONDUCTORS

A. Conductor Material: Unless noted otherwise, conductors shall be copper, 98.5% conductivity except where specifically noted otherwise on Drawings.

B. All wire and cable for feeders and branch circuits shall have copper conductors and shall be 600 volts, 90 degrees C, NEC type conductors with THHN/THWN-2 insulation.

C. Wire No. 8 AWG and larger shall have stranded conductors. Wire No. 10 AWG and smaller shall be solid conductor type.

D. No conductor shall be smaller than No. 12 AWG unless otherwise specified or noted.

E. Branch circuit wiring which supplies more than one fluorescent fixture through the wiring of other fixtures shall be high temperature wire approved for such use.

F. Pulling lubricant is neither required nor allowed for Southwire/SIMpull™ conductors.

2.03 ALUMINUM CONDUCTORS

A. Aluminum conductors are not acceptable.

2.04 METAL CLAD "MC" CABLE

A. Where allowed by the authority having jurisdiction, the use of metal clad cable is permitted as described below and shall meet all the requirements of the following codes and standards:
   1. Underwriters Laboratories Inc. 83, 1479, 1569, and 1581
   2. National Fire Protection Association NFPA 70, Article 330
   3. All local codes and municipal ordinances.

B. The conductors of the metal clad cable shall comply with Articles 1.03 and 2.02 of this same section.

C. Unless noted otherwise on drawings, MC cable shall be limited to branch circuits concealed in walls, above ceilings and within electrical rooms. Unless noted otherwise, metal clad cable may not be run directly into surface-mounted panelboards, cabinets, switches or other devices. For MC cable circuits powered from a surface-mounted panelboard, cable homeruns shall be installed to a metal wireway above the panelboard, and conductors (without armor) shall be routed within metal conduit(s) from wireway to panelboard. Ampacity adjustment factors are not necessary for conduit lengths of 24" or less.

D. MC cable shall not be allowed for wiring to mechanical equipment.

E. Unless noted otherwise, the metal clad cable shall be **MC** with either a galvanized steel jacket or aluminum interlocked armor, a Mylar assembly covering tape, rated at 90 degrees centigrade, with either a green insulated grounding conductor or MC^{AP} Type MC cable with interlocked armor that is listed and identified for grounding, and rated for a maximum of 600 volts.

F. Refer to National Electrical Code Article 330 for uses not permitted.

G. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1/16 inches thick, shall be considered supported and secured where such support does not exceed six (6) feet intervals.

H. Cables containing four or fewer conductors sized not larger than No. 10 AWG shall be secured within 12 inches of every box, cabinet, fitting or other cable termination.

I. Metal clad cable shall not be installed outside the building without written authorization from the Engineer.

2.05 ACCESSORIES

A. Wire Joints: T & B "Sta-Kon," Scotchlok Type "R," Ideal No. 452 or 453, or Buchanan "B-Cap."

B. Cable Connectors: Solderless Type O.Z. "circular clamp type" or T & B "lock-tite" appropriate for the particular application involved.

PART 3 - EXECUTION

3.01 PREPARATION

A. Lubricant: No grease, oil or lubricant other than powdered soapstone or approved pulling compound shall be used to facilitate the pulling of wires. Lubricant shall not be used for conductors with SIMpull™ insulation.

3.02 INSTALLATION

A. Complete electrical systems shall be provided as shown on the Drawings and/or as specified herein.

B. Wires shall be pulled without excessive strain to prevent damage to conductor or insulation. Provide pull boxes as required to facilitate pulling of wire.

C. Prior to energizing, all service and feeder cables shall be tested with megohm meter to determine insulation resistance levels. Test report shall be submitted to the Engineer.

D. Each raceway indicated by symbol on Drawings shall contain three (3) No. 12 AWG wires unless otherwise noted, scheduled or indicated. Hatch marks on raceway symbols indicate the number of conductors in a raceway when the number exceeds three (3).

E. At each fixture or device outlet, a loop or end of wire not less than 6" long shall be left for connection to fixture or device.

F. Splices, taps and connections shall be made up as follows:
   1. Wire sizes No. 10 AWG and smaller with wire nuts.
   2. Wire and cable of sizes No. 8 AWG and larger, with insulated mechanical or crimped connectors.

G. Perform conductor tests as described in Section 26 00 00 - Electrical General.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work required under this section of the Specifications consists of furnishing, installation and connections of the building grounding system. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be 3-phase, 4-wire grounded wye system supplemented with equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.02 REGULATORY REQUIREMENTS

A. Install a complete grounding system in accordance with the National Electrical Code.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide all materials under this section of the specifications.

B. All materials shall be new, UL Listed, and bear a UL Label.

C. Refer to Section 26 05 19 - Conductors for conductor specification.

2.02 GROUNDING CONDUCTORS

A. Grounding electrode conductor shall be bare or green insulated copper conductor sized as indicated on the Drawings.

B. Equipment grounding conductors shall be green insulated conductors sized as indicated on the Drawings. Where size is not indicated on the Drawings, conductor size shall be determined from the National Electrical Code table on sizes of equipment grounding conductors.

C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code tables for grounding electrode conductors.

2.03 PANELBOARDS, TRANSFORMERS, AND DISCONNECT SWITCHES

A. Provide each low voltage distribution and branch circuit panelboard with a copper equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar.

B. Provide a conductor termination grounding lug bonded to the enclosure of each equipment item.

2.04 DEVICES

A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame.

2.05 GROUND RODS

A. Ground rods shall be 3/4" x 10'-0" copper clad steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground all non-current carrying parts of the electrical system including raceways, equipment frames and enclosures, outlet boxes, junction boxes, and other conductive material in close proximity with electrical circuits.

B. Service entrance and separately derived electrical systems, grounding electrode system
   1. The grounded conductor(s) of the electrical service serving the premises wiring system shall be connected to the neutral bus bar in the service equipment which shall be grounded to the cold water system, the ground rod system, and other grounding electrodes specified herein or indicated on the Drawings. Grounding electrode conductors shall be installed rigid, nonmetallic conduit to point of ground connection, unless subject to physical damage in which case it shall be installed in galvanized rigid steel.
   2. Make connection to main water line entering the building. Make connections ahead of any valve or fittings whose removal may interrupt ground continuity.
   3. Bond together the following systems to form the grounding electrode system. All system connections shall be made to the electrodes as close as possible to the service entrance equipment and each connected at the service entrance equipment neutral bus. Do not connect electrode systems together except at neutral bus.
      a. Cold water piping system
      b. Ground rod system
      c. Rebar in concrete footing
      d. Structural steel metal building frame
      e. Lightning protection system
   4. Ground the neutral of all dry type transformers to either building steel or a common grounding electrode conductor connected to a service ground. Transformers shall be bonded to the nearest available point on the interior water piping system. In reinforced concrete structures building steel shall be considered to be reinforcing steel of vertical columns.
   5. Grounding electrode connections to structural steel, reinforcing bars, ground rods, or where indicated on the Drawings shall be with chemical exothermic weld connection devices recommended for the particular connection type. Connections to piping shall be with UL Listed mechanical ground clamps.
   6. Where there is more than one service to a building or interconnected buildings, services shall be connected by means of a grounding electrode conductor.
   7. Bonding shall be in accordance with the National Electrical Code.
   8. Install ground rods where indicated on the Drawings with the top of the ground rods 12 inches below finished grade.

9. Ground the neutral and frame of the emergency generator to building steel and the main electrical service ground rod system. In reinforced concrete structures building steel shall be considered to be reinforcing steel or vertical columns. Make connection to building steel with chemical weld type connector, in a location in unfinished space where the connection will not be subject to physical abuse.
10. Generator ground and neutral connections shall be bonded together.

C. Equipment Grounding Conductor
1. Grounding conductors for branch circuits are not shown on the Drawings; however, grounding conductors shall be provided in all branch circuit raceways and cables.
2. Grounding conductors for feeders are typically indicated on the Drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the Drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.

D. Other Grounding Requirements
1. Each telephone backboard shall be provided with a No. 6 grounding conductor. When backboard is located in vicinity of electrical service equipment, the "point of grounding" of this conductor shall be the main cold water service with connections made ahead of any valves or joints. Remote backboards shall use building steel as "point of ground." Terminate conductor by stapling to backboard.
2. At each building expansion joint flexible copper bonding jumpers shall be attached to building structure by chemical weld process. Install bonding jumpers in concealed locations that will not subject connections or jumpers to physical abuse. Install 100' on centers across expansion joints.

3.02 TESTING

A. Upon completion of the ground rod installation, the Contractor shall test the installation in accordance with the "Electrical Testing" section of Section 26 00 00 - Electrical General. Grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within 48 hours of rainfall.

3.03 GROUNDING FOR LOW VOLTAGE SYSTEMS

A. The grounding and bonding system that supports low voltage systems shall be designed in accordance with the recommendations contained in the J-STD-607-A Telecommunications Bonding and Ground Standard.

B. All telecommunications rooms shall be equipped with a telecommunications ground busbar (TGB). Each TGB shall be connected to the building's electrical ground at the electrical room closest to its proximity.

C. All wires used for communications grounding purposes shall be identified with green insulation. Non-insulated wires shall be identified at each termination point with a wrap or green tape. All cables and busbars shall be identified and labeled in accordance with the ANSI/TIA/EIA-606-A.

END OF SECTION 26 05 26

SECTION 26 05 30 - FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 26 shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Firestopping for Electrical Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. Typical firestopping installation details will be provided on Drawings as an attachment to this document. If the bid documents are in conflict, the Drawings shall take precedence. The successful Contractor shall meet or exceed all requirements described in this document.

1.02 WORK INCLUDED

A. The work included under this Specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.

B. The work shall include, but not be limited to the following:
   1. Furnish and install all Firestopping Materials.

PART 2 - PRODUCTS

2.01 APPROVED PRODUCTS

A. Approved Firestopping manufacturer(s)
   1. FlameStopper Thru-Wall Fitting - Wiremold Company (Firestop Devices)
   2. Tremco Inc. (Firestop Cast in Place Sleeves, Caulks, QuickComm Sleeves, QuickComm Units, Pillows, Putty Pads, Outlet Box Inserts, Silicone, Composite Sheets, Collars, Devices)
   3. STI Firestop Products (Firestop Devices, Putties, Caulks, Sealants, etc.)
   4. Hilti (Putties, Caulks, Sealants, etc.)

2.02 TYPES OF PRODUCTS

A. Firestop Products
   1. Intumescent Firestop Sealants and Caulks
   2. Acrylic Firestop Sealant and Caulks
   3. Silicone Firestop Sealants and Caulks
   4. Cast in Place Devices
   5. Firestop Putty, Putty Pads
   6. Outlet Box Inserts

7. QuickComm Sleeves
8. TREMstop Straps
9. Firestop Collars
10. Wrap Strips
11. Firestop Mortar
12. Firestop Pillows
13. Accessories: Forming/Damming Materials: Mineral Wool, Backer Rod or other type as per manufacturer recommendation.

B. Firestop Devices
   1. Thru-Wall Fitting (FlameStopper by Wiremold)
      a. The firestop device box shall be constructed of 16-gauge G90 steel.
      b. The firestop device intumescent block shall be constructed of a graphite base material with expansion starting at 375 degrees F and an unrestrained expansion between 6 to 12 times. The intumescent block shall be held securely by the box in order to prevent tampering and damage during installation.
      c. The firestop device shall have doors which can be adjusted to prevent materials from penetrating the device if the device is empty or completely full. The doors shall be constructed of 16-gauge G90 steel with No. 10-32 screws use to adjust opening size.
      d. The firestop device shall be available for 2" and 4" trade size EMT conduit.
      e. The firestop device shall be available in safety yellow powder coat, custom colors and an unpainted galvanized finish.
   2. Fire Rated Cable Pathway (STI EZ-PATH)
      a. Fire rated cable pathway device modules shall be comprised of steel raceway with intumescent foam pads allowing 0 - 100% cable fill.
   3. Tremco (QuickComm Unit) 24" x 12" or 34" x 18"
      a. Fire rated steel frame with an intumescent channel. UL Tested for large openings with 100% visual cable fill. UL Tested for Concrete Floors, Block Walls, Dry Walls and Hollow Core Floors.
   4. Tremco (QuickComm Sleeve)
      a. Fire rated steel sleeve with an intumescent inner sleeve. UL Tested for Concrete Floors, Block Walls, Dry Walls, Hollow Core and Fluted Decks.

2.03 UL CLASSIFICATION

A. Thru-Wall Fitting: The firestop device for use in through-penetration firestop systems shall have been examined and tested by Underwriters Laboratories Inc. to UL1479 (ASTM E 814 & ASTM E 84).

B. Threaded, Smooth and Split-Sleeve Firestop Devices: Firestopping sealants and devices shall be used together as a firestop system. All firestop systems shall bear a UL Classification system number.

C. QuickComm Sleeve: Firestop Sleeve for use in through penetration firestop systems. Shall be tested by Underwriters Laboratories Inc. or a recognized Testing Laboratory for through penetration fire stopping applications.

D. QuickComm Unit: Intumescent Firestopping Unit for use in large openings for firestopping for cables, Fiber optic, Power Control, Telecommunications
   1. Threaded Firestop System
      a. Block Wall - W-J-3049
      b. Dry Wall - W-L-3138
   2. Threaded Firestop System (Vertical)
      a. Slab - F-A-3010
   3. Smooth Firestop System
      a. Block Wall - W-J-3048
      b. Dry Wall - W-L-3137
   4. Split-Sleeve Firestop System
      a. Block Wall - W-J-3047
      b. Dry Wall - W-L-3136
   5. Tremco QuickComm Sleeve
      a. Block Wall- C-AJ-0123, C-AJ-2580, C-AJ-3270
      b. Dry Wall- WL-0025, WL-2418, WL-3318
      c. Concrete Floor- C-AJ-0123, C-AJ-2580, C-AJ-3270
      d. Fluted Deck- C-AJ-0123
      e. Hollow Core- C-AJ-0123, C-AJ-2580, C-AJ-3318
   6. Tremco QuickComm Unit
      a. Dry Wall- WL-3319, WL-4070
      b. Concrete Floor- F-A-3035, F-A-4006

2.04 FIRESTOPPING SYSTEMS

A. Thru-Wall Fitting Firestop System
   1. The device shall be classified for use in one-, two-, three-, and four-hour rated gypsum, concrete and block walls and provide an L rating of less than 5 cfm. The device shall also be tested by Underwriters Laboratories Inc. to UL2043 and determined to be suitable for use in air handling spaces.

B. Threaded, Smooth and Split-Sleeve Firestop Systems
   1. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 and ASTM E 84 (UL 1479) fire tests in a configuration that is representative of field conditions.
   2. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

C. Firestopping materials and systems must be capable of closing or filling through-openings created by the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials.

D. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.

E. Firestopping sealants must be flexible, allowing for normal pipe movement.

F. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.

G. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

H. Firestopping material shall be installed inside the cavity of the wall as shown by the annular space requirements in the UL Tested System.

PART 3 - EXECUTION

3.01 CONDITIONS REQUIRING FIRESTOPPING

A. General
   1. Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.

B. Through-Penetrations
   1. Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.

C. Membrane-Penetrations
   1. Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet ASTM E 814 and ASTM E 84 Test requirements.

D. Smoke-Stopping
   1. As required by the other sections, smoke-stops shall be provided for through-penetrations, membrane-penetrations, and construction gaps with a material approved for the ASTM E 136 Standards.

3.02 EXAMINATION

A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Verify that environmental conditions are safe and suitable for installation of firestop products.

C. Verify that all pipes, conduit, cable, and other items that penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.03 INSTALLATION

A. General
   1. Through Penetration firestop submittals showing each UL Rated Assembly shall be located in the general Contractor's trailer for Inspection purposes.
   2. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Written documentation stating training done on the specific project shall be supplied to the General Contractor for inspection purposes. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

3. Apply firestops in accordance with UL Tested Systems, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
4. Unless specified and approved, all insulation used in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
5. Seal holes and penetrations to ensure an effective smoke seal. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
    a. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
    b. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.

B. Dam Construction
1. When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.

3.04 FIELD QUALITY CONTROL

A. Preconstruction meeting shall take place to address firestopping systems to be installed.

B. Prepare and install firestopping systems in accordance with UL Tested System and manufacturer's printed instructions and recommendations.

C. Follow safety procedures recommended in the Material Safety Data Sheets.

D. Finish surfaces of firestopping that are to remain exposed in the completed work to a uniform and level condition.

E. All areas of work must be accessible until inspection by the applicable Code Authorities.

F. Correct unacceptable firestops and provide additional inspection to verify compliance with this Specification.

3.05 CLEANING

A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

B. Leave finished work in a neat and clean condition with no evidence of spillovers or damage to adjacent surfaces.

END OF SECTION 26 05 30

SECTION 26 05 33 - CONDUIT AND RACEWAYS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This section covers the complete interior and exterior conduit system.

B. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

1.02 STANDARDS

A. Industry Standards
   1. Underwriters Laboratories Inc. (UL) Publications
      - No. 1: Standard for Flexible Metal Conduit
      - No. 6: Standard for Rigid Metal Conduit
      - No. 467: Standard for Grounding and Bonding Equipment
      - No. 651: Standard for Schedule 40 and 80 Rigid PVC Conduit
      - No. 797: Electrical Metallic Tubing - Steel
      - No. 1242: Standard for Electrical Intermediate Metal Conduit - Steel
   2. American National Standards Institute (ANSI)
      - C-80.1: Rigid Galvanized Conduit
      - C-80.3: Electrical Metallic Tubing

1.03 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install conduits and raceways, complete, as indicated on the Drawings and as specified herein.

B. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers
   1. Metallic Conduit Fittings
      a. Thomas and Betts
      b. Appleton
      c. RACO
      d. Crouse Hinds
      e. Steel City
   2. Support Channel
      a. Unistrut

b. Kindorf

3. Non-metallic Conduit Fittings
   a. Carlon
   b. Georgia Pipe Company
4. Rigid, IMC or Flexible Conduit
   a. Allied
   b. Republic
   c. Triangle
   d. Wheatland
   e. Youngstown
   f. Southwire
5. Flexible Conduit (PVC Conduit)
   a. Anaconda “Sealtite”
   b. Robroy
   c. Southwire
6. Electrical Metallic Tubing
   a. Steeltubes
   b. National
   c. Wheatland
   d. Allied
   e. Triangle
   f. Youngstown
7. Plastic PVC
   a. Carlon
   b. Georgia Pipe Company
8. Pull Box Manufacturer(s)
   a. Hoffman
   b. OZ Gedney
   c. Or Approved EquaL
9. Approved Marker Tape Manufacturer(s)
   a. William Frick & Associates
   b. Or Approved Equal
10. Approved Maintenance Hole/Handhole Manufacturer(s)
    a. Old Castle
    b. Pencell (Handholes Only)
    c. Quazite (Handholes Only)
    d. Or Approved Equal
11. Approved Conduit Plug/Cap Manufacturer(s)
    a. Jack Moon
    b. Or Approved Equal

2.02 CONDUIT FITTINGS

A. Electrical metallic tubing (EMT) couplings and connectors shall be steel. Malleable iron, pressure cast or die cast fittings are not permitted.

B. Fittings and couplings shall be set-screw type and/or compression type per 3.01 13. Steel set screw type for 2.5" conduit and larger shall have 2 screws for connectors and 4 screws for couplings. All connectors shall be insulated throat type.

C. Rigid steel and IMC couplings and connectors shall be standard threaded couplings, locknuts, bushings and elbows. All materials shall be steel. Erickson-type couplings may be used to complete a conduit run.

2.03 NON-METALLIC CONDUIT AND FITTINGS

A. Non-metallic conduit shall be heavy wall, Schedule 40 PVC.

B. Couplings and connectors for non-metallic conduit shall be of the same material and be the product of the same manufacturer of the conduit furnished.

C. PVC conduit for concrete encasement shall be Type DB, UL Labeled for 90 degrees C cables. Fittings shall be Type DB, solvent type, and from the same manufacturer as the conduit.

D. Concrete shall have a minimum strength of 2,500 psi at 28 days.

2.04 CONDUIT SUPPORT

A. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose and sized appropriately for the conduit type and diameter. Support individual conduits 1-1/2" and smaller with 1/4" threaded steel rods and use 3/8" rods for 2" and larger.

B. Conduit support channels shall be 14-gauge galvanized (or equivalent treatment) channel sized for the amount of conduit to be supported. Channel suspension shall be 3/8" threaded steel rods. Conduit straps shall be spring steel type compatible with channel.

C. Conduit straps shall be single-hole cast metal type or two-hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.

2.05 RIGID METALLIC CONDUIT, INTERMEDIATE METALLIC CONDUIT, AND ELECTRICAL METALLIC TUBING

A. Rigid metallic conduit and intermediate metallic conduit shall be steel and standard thread.

B. Electrical metallic tubing (EMT) shall be steel.

C. Minimum conduit size shall be 3/4”.

2.06 RIGID METALLIC, INTERMEDIATE METALLIC, AND FLEXIBLE CONDUIT AND FITTINGS

A. Rigid metallic conduit and intermediate metallic conduit shall be steel and standard thread.

B. Flexible conduit shall be steel or aluminum type classified for system grounding.

C. Connectors for flexible conduit shall be insulated throat type rated as suitable for system ground continuity.

D. Flexible conduit used for other than connections to lighting fixtures shall not be less than 3/4" trade size. 3/8" flexible conduit may be used for connection to lighting fixtures when sized according to the National Electrical Code.

E. Flexible conduit used in damp or wet locations shall be liquid tight.

F. Minimum conduit size shall be 3/4".

2.07 PULL BOXES

A. Pull boxes shall be constructed of galvanized steel with flat, removable covers fastened with plated steel screws.

B. Pull boxes shall be equipped with keyhole screw slots in the cover to permit removal of the cover without extracting the screws.

C. Pull boxes shall have provisions for grounding.

2.08 CONDUIT PLUGS/CAPS

A. Conduit Plugs/Caps
   1. Conduit plugs shall provide a watertight seal at expose ends of conduits.
   2. Conduit plugs shall be conduit size specific.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General
   1. Minimum size for electrical conduits shall be 3/4" trade size.
   2. Minimum size for low voltage conduits shall be 3/4" trade size.
   3. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the drawings.
   4. Leave all empty conduits with a 200 pound test nylon cord pull line.
   5. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.
   6. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel.
   7. Protect conduits against dirt, plaster, and foreign debris with conduit caps or plugs, which shall remain in place until all masonry is complete. Protect conduit stub-ups during construction from damage, any damage conduits shall not be used and are to be replaced.
   8. All feeder conduits shall be cleared of any dirt, foreign debris, etc.
   9. Install conduit with wiring, including homeruns as indicated on the drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a Contract change. Deviations shall be made only where

necessary to avoid interferences and when approved by Engineer by written authorization.

10. Conduits which penetrate roof membranes shall be installed in accordance with manufacturer's recommendations and architectural specifications.
11. Seal all conduits entering building from below grade, all conduits entering refrigerated spaces i.e. freezers and coolers, and all conduits entering exterior mounted electrical equipment with insulating electrical putty to prevent entrance of moisture.
12. Separate raceway systems are to be installed for power systems and for control, signal and communications systems. Do not install control, signal or communications cables in the same raceways as branch circuit or feeders cables, unless indicated otherwise on the drawings.
13. Conduit fittings shall be set screw type for dry, indoor environments. Conduit fittings shall be gland and ring compression type for all conduit exposed to outdoor environments or wet locations.
14. Conduit shall be run parallel or at right angles to walls, ceilings, and structural members.
15. Support conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, fitting, panelboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
16. Attach feeder conduits larger than one inch trade diameter to or from structure on intervals not exceeding twelve feet with conduit beam clamps, one-hole conduit straps or trapeze type support.
17. Where conduits must pass through structural members obtain approval of Architect.
18. Install all conduits or sleeves penetrating or routed within rated fire walls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.
19. Provide expansion and deflection coupling where conduit passes over a building expansion joint.
20. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
21. Telephone and signal system raceways: 2" trade size and smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

B. Uses Permitted

1. Conduits installed within concrete floor slabs shall be galvanized rigid steel (GRS), intermediate metal conduit (IMC), Schedule 40, heavy wall PVC, or electrical non-metallic tubing (ENT).
2. Conduit run exterior exposed: Galvanized rigid steel (GRS) or intermediate metal conduit (IMC).

3. Conduits in direct contact with earth shall be Schedule 40, heavy wall PVC. Elbows for underground conduits greater than 200' in length shall be galvanized rigid steel (GRS), or electrical metallic tubing (EMT) if elbows are concrete encased. Service entrance conduits installed exposed, or concealed in walls or above ceilings, shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC). Unless indicated otherwise, service entrance conduits shall be installed "outside" of the building as defined by the NEC. Provide concrete encasement where required or as indicated on drawings.
4. All other conduit, unless specified herein, not permitted in accordance with the NEC, or otherwise indicated on the drawings, shall be electrical metallic tubing (EMT). PVC conduit is not allowed in exposed or concealed areas, but only within concrete or below grade. Feeder or branch circuit conduits that emerge from a floor slab in an exposed location shall be galvanized rigid steel (GRS), electrical metallic tubing (EMT) or intermediate metal conduit (IMC). Where conduits emerge from a floor slab in a concealed location (a wall cavity or above ceiling), PVC elbows are permitted, provided that a conduit adaptor for steel conduit is installed at the nearest point at the slab.
5. Use flexible conduit for connections to motors, dry type transformers, electrical duct heaters, unit heaters, kitchen equipment, laundry equipment, flush mounted lighting fixtures, and any vibrating equipment.
    a. Flexible conduit used for connection of motors, dry type transformers, electric duct heaters, unit heaters, and bus duct tap devices shall not exceed 36 inches in length.
    b. Flexible conduit from outlet box to flush mounted lighting fixture shall not exceed 6 feet in length.
    c. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
    d. Flexible conduit installed within plenum spaces shall be limited to lengths not exceeding 4 feet.
    e. Liquid tight flexible conduit shall be used to connect equipment in exterior, damp or wet locations.

C. Below Grade Raceway Installations
1. Install top of conduits 2 inches minimum below bottom of building slabs.

D. Raceway Installations within Concrete
1. Conduit shall be run following the most direct route between points.
2. Conduit shall not be installed in concrete where the outside diameter is larger than 1/3 of the slab thickness.
3. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduit shall not be run directly below and parallel with load bearing walls.
4. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
5. Provide expansion fittings in all conduits that pass through building expansion joints.

3.02 PULL BOXES

A. Pull boxes shall be secured, independent of the conduit entries into the box. Pull boxes shall be secured to the building structure. In ceiling applications, pull boxes shall not be supported with ceiling wires.

B. Conduits entering pull boxes shall connect to pull boxes using die-cast zinc connectors.

C. Pull boxes shall be free from burrs, dirt and debris.

3.03 CONDUIT PLUGS/CAPS

A. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until ready for use.

B. Simplex, triplex or quadplex duct plugs shall be installed in conduits to house and seal cables.

3.04 ADDITIONAL REQUIREMENTS FOR INTERIOR LOW VOLTAGE CONDUITS

A. Conduit runs shall not have more than two (2) 90-degree bends between pull points.

B. Communications conduit system shall contain no condulets (also known as an LB).

C. Rigid metal conduit (RMC) or intermediate metal conduit (IMC) shall be used for entrance conduits that exceed 50 feet into the building.

D. Horizontal Conduits

1. Support horizontal conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, backboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
2. For runs that total more than 100 feet in length, insert pull boxes so that no segment between boxes exceeds the 100 feet limit.
3. Each horizontal home-run conduit can serve from one (1) to three (3) outlet boxes. For one (1) outlet box, a 3/4" conduit shall be used, minimum. For two (2) outlet boxes, a 1" conduit shall be used, minimum. For three (3) outlet boxes, a 1-1/4" conduit shall be used, minimum.

END OF SECTION 26 05 33

SECTION 26 05 34 - OUTLET BOXES AND JUNCTION BOXES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

1.02 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install outlet and junction boxes, complete, as indicated on the Drawings and as specified herein.

B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made the Contractor shall be responsible for the costs of any item and engineered and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.03 QUALITY ASSURANCE

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

1.04 JOB CONDITIONS

A. Protection: Anchor boxes securely to formwork. Provide necessary protection to prevent entry of concrete.

B. Sequencing, Scheduling: Locations of outlets shown on the Drawings are relative and approximate. Exact locations shall be determined on the job and the outlets accurately set according to the architectural drawings, dimensions, casework kneespace, building conditions, furniture positions and Architect's direction. The right is reserved to change the exact location (10'-0" or less) of any switch, ceiling outlet or other outlet in any room before it is permanently installed without increase in Contract cost.

C. All outlet boxes and junction boxes shall be accessible. Any boxes in non-accessible areas (furred ceilings) shall be set flush with barrier surface at a location approved by the Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: National Electric Products Company, Thomas & Betts/Steel City, Appleton or Raco.

2.02 OUTLET BOXES

A. Standard Outlet Boxes: Boxes and covers shall be galvanized steel not less than 1/16" thick and in every instance, of such form and dimensions as to be adapted to its specific use and location, kind of fixtures to be used and number, size and arrangement of conduits connecting thereto and particularly sized to accommodate the number and size of wires to be contained therein.

B. Ceiling outlet boxes shall be 1-1/2" or 3-3/8" deep, 4" octagonal (or 4" square when required due to number of wires). Plaster rings or device covers need not be provided on ceiling boxes. Provide extension rings on ceiling boxes to accommodate number of conductors in box.

C. Wall outlet boxes for toggle switches and convenience outlets shall be 1-1/2" or 2-1/8" deep, 4" or 4-11/16" square. Provide with single-device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.

D. Outlet boxes for telecommunication purposes (telephone, data, etc.) shall be 4" x 4" square, 2-1/8" deep. Provide with single device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.

E. Junction boxes shall be as specified for ceiling and wall outlet boxes. Provide flat covers on ceiling outlets to match ceiling finish. Provide blank device type coverplates on wall outlets, of same materials as specified for device coverplates in same room or area.

F. Outlet boxes where exposed rigid conduit is used shall be cast ferrous alloy, galvanized or cast aluminum.

G. Covers: Where outlet boxes are to be capped, blank coverplates shall be used.

H. Barriers: Provide barriers between devices operating at different voltages or on separate systems such as normal, critical, or life safety.

2.03 FLOOR BOXES

A. Product Description

1. Floor boxes for receptacles and telephone/data outlets shall be rectangular, non-metallic PVC. Boxes shall be suitable for use in slab-on-grade or above grade. Boxes shall include a non-metallic concrete cover to prohibit concrete or debris from entering the box during installation.
2. Provide number of compartments as indicated on drawings.
3. Coverplates and flanges shall be brass.
4. Floor box device covers shall meet UL 514C requirements for scrubwater test standards.

B. Manufacturer
1. Hubbell PFBRG Series
2. Walker/Wiremold 880MP Series
3. Thomas & Betts 640P Series

C. For poke-thru devices, refer to 2.04 D of Section 26 27 26 - Wiring Devices.

2.04 PULL AND JUNCTION BOXES

A. Pull and Junction boxes are not completely indicated. They shall be sized and installed where required in accordance with the NEC.

B. Pull and Junction boxes shall be the suitable NEMA type number to match the environmental conditions.

C. Locations of concealed pull and junction boxes shall be indicated on the record as built drawings for Owner's record.

2.05 CABINETS, FITTINGS, BOXES: GENERAL

A. Cabinets shall be in accordance with UL 50, "Electrical Cabinets and Boxes" and NEMA 250, Type 1. Electrical cabinets, boxes and fittings shall be as required for types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and accessories required for the intended use. Provide gaskets for units in damp or wet locations.

B. Construction shall be sheet steel, NEMA 1 class except as otherwise indicated. Cabinets shall consist of a box and a front consisting of a 1-piece frame and a hinged door. Arrange door to close against a rabbet placed all around the inside edge of the frame, with a uniformly close fit between door and frame. Provide concealed fasteners, not over 24" apart, to hold fronts to cabinet boxes and provide for adjustment. Provide flush or concealed door hinges not over 24" apart and not over 6" from top and bottom of door. For flush cabinets, make the front approximately 3/4" larger than the box all around. For surface mounted cabinets make from same height and width as box. Furnish metal barriers to separate wiring of different systems and voltage, and furnish accessory feet where required for freestanding equipment.

C. Fasteners for general use shall be corrosion resistant screws and hardware including cadmium and zinc plated items.

D. Fasteners for damp and wet locations shall be stainless steel screws and hardware.

E. Exterior finish shall be gray baked enamel for items exposed in finished locations except as otherwise indicated.

F. Painted interior finish, where indicated, shall be white baked enamel.

G. Fittings for boxes, cabinets, and enclosures shall be in accordance with UL 5148 and shall be zinc plated steel for conduit hubs, bushings and box connectors.

2.06 UNDERGROUND PULL/JUNCTION BOXES

A. Unless noted otherwise, underground enclosures shall be fiberglass, open-bottom and sloped-wall. Covers shall be polymer concrete. Boxes shall be installed in areas expected to experience only light incidental, non-deliberate vehicular traffic (including that from mowers).

B. Enclosures shall meet the load requirements and three-point test procedures specified in the industry standard ANSI SCTE 77 2007. Enclosures shall meet the Tier 8 cover load test (for light traffic) of 12,000 lbs. over a 10" x 10" plate.

C. Manufacturer's guidelines shall be followed for installation, including 6" gravel bed beneath box for stability and drainage. Concrete collar shall be poured around enclosure to protect the ring and top from impact due to soil erosion.

D. Manufacturer
   1. Highline Products
   2. OZ-Gedney

PART 3 - EXECUTION

3.01 INSPECTION

A. The location of all wall outlets, including light fixtures, receptacles, switches, etc., shall be checked to see that the outlet will clear any wall fixture, shelving, work tables, sinks, baseboard and fin type convectors, bulletin boards, etc., that will be installed.

B. Exact locations of outlet boxes shall be coordinated with other trades so that outlet will not be covered by ductwork, piping, etc.

C. The approximate locations of outlets are indicated on the Drawings. The exact locations shall be determined at the building. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

3.02 PREPARATION

A. Architectural Placement: Outlets occurring in architectural features shall be accurately centered in same. Space wall switch outlets equidistant from door trims on the strike side of doors as actually installed so that coverplate clears trim. Orientation of outlet boxes (horizontal or vertical) shall be as indicated on architectural elevations.

B. Install all outlet boxes in finished areas flush with wall or ceiling finish. Maintain 1/4" or less space between outlet box front and finish wall surface.

C. All switches at same level shall be installed on one horizontal line as shown on the Drawings.

D. Wall mounted controls, including temperature controls, in a room shall be grouped at the same location and at same mounting heights.

3.03 INSTALLATION

A. At all concealed outlets for electric lights, switches, wall receptacles, etc., standard outlet boxes and plaster rings shall be provided.

B. Outlet boxes shall be firmly anchored in place and shall be provided with approved fixture studs where required. Outlet boxes shall not depend on the coverplate to hold it secure to the wall.

C. Boxes on opposite sides of walls or partitions: Where drawings show back-to-back wiring devices, the devices on opposite sides of the wall shall be offset a minimum of 6". Through-the-wall type boxes shall not be used. Where boxes will be located on opposite sides of walls or partitions located 24" or closer to each other, moldable putty pads shall be installed to completely cover the exterior surfaces of the box within the stud cavity with a ball of putty material used to plug the end of each conduit at its connection to the box.

D. All holes cut through new or existing smoke or fire partitions shall be sealed. Sealant shall be 3M Brand Fire Barrier System or approved equal. Seals shall be installed in accordance with manufacturer's recommendations.

E. All flush boxes in rated walls that are larger than 16 square inches in area shall be backed as follows: 1-hour wall - 1 layer of 5/8" gypsum board; 2-hour rated wall - 2 layers of 5/8" gypsum board. Gypsum shall be fire code and attached to outside surfaces of box(es).

F. Cast aluminum, threaded hub type boxes with gasketed weatherproof covers shall be used for wet locations where box is surface mounted.

G. Location of floor boxes indicated is approximate. The Contractor shall refer to the final furniture layout or request field instructions for the exact location. Consult the Architect prior to installation.

END OF SECTION 26 05 34

SECTION 26 09 23 - OCCUPANCY SENSORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor's work shall include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.

B. The Contractor/supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.

C. The Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.02 EQUIPMENT QUALIFICATION

A. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.

B. All components shall be UL Listed, offer a 5-year warranty and meet all state and local applicable code requirements.

C. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

D. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.03 SYSTEM DESCRIPTION

A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

C. The Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the Owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the Owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

1.04 SUBMITTALS

A. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

B. Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor.

C. Submit any interconnection diagrams per major subsystem showing proper wiring.

D. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

E. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.05 SYSTEM OPERATION

A. It shall be the Contractor's responsibility to make all proper adjustments to assure Owner's satisfaction with the occupancy system.

1.06 ACCEPTABLE MANUFACTURERS

A. The Watt Stopper, or Pre-Approved Equal: For pre-approval, provide all the information listed under section 1.04 A and 1.04 D a minimum of ten (10) working days prior to initial bid date.

B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

PART 2 - PRODUCTS

2.01 GENERAL

A. All products shall be Watt Stopper product numbers.
   1. Ceiling Sensors: WT-605, WT-600, WT-1105, WT-1100, WT-2205, WT-2200, WT-2250, WT-2255, W-500A, W-1000A, W-2000A, W-2000H, WPIR, DT-200, DT-205, CX-100, CX-105, CI-200, CI-205.
   2. Wall Sensors: WI-200, WS-120/277, WA-100, WD-170, WD-180, WD-270, WD-280.
   3. Power and Slave Packs: B120E-P, B277E-P, C120E-P, C277E-P, S120/277-P, AT-120.

B. Wall switch sensors shall be capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet.

C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,200 watts at 277 volts and shall have 180 degrees coverage capability.

D. Wall switch products shall utilize Zero Crossing Circuitry, which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.

E. Wall switch sensors shall have no leakage current to load, in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.

F. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.

G. Where specified, vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0 mm thickness. Products utilizing a soft lens will not be considered.

H. Passive infrared sensors shall utilize Pulse Count Processing and Digital Signature Analysis to respond only to those signals caused by human motion.

I. Passive infrared sensors shall utilize mixed signal ASIC which provides high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line), superior performance, and greater reliability.

J. Passive infrared sensors shall have a multiple segmented Lodif Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.

K. Where specified, passive infrared and dual technology sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.

L. Dual technology sensors shall be corner mounted to avoid detection outside the controlled area when doors are left open.

M. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.

N. Ultrasonic sensors shall utilize Advanced Signal Processing to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.

O. Ultrasonic operating frequency shall be crystal controlled at 25 kHz within + 0.005% tolerance, 32 kHz within + 0.002% tolerance, or 40 kHz + 0.002% tolerance to assure reliable performance and eliminate sensor crosstalk. Sensors using multiple frequencies are not acceptable.

P. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

Q. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

R. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Setting shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

S. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

T. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

U. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

V. All sensors shall have UL rated, 94V-0 plastic enclosures.

2.02 CIRCUIT CONTROL HARDWARE – CU

A. Control Units: For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control unit shall provide power to minimum of two (2) sensors.

B. Relay Contacts shall have rating of:

13A - 120 VAC Tungsten
20A - 120 VAC Ballast
20A - 277 VAC Ballast

C. Control wiring between sensors and controls units shall be Class II, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

PART 3 - EXECUTION

3.01 INSTALLATION

A. It shall be the Contractor’s responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer’s recommendations. Rooms shall have 90 to 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The Contractor shall provide additional sensors if required to properly and completely cover the respective room.

B. It is the Contractor’s responsibility to arrange a pre-installation meeting with the manufacturer’s factory authorized representative, at the Owner’s facility, to verify placement of sensors and installation criteria.

C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The Contractor shall also provide, at the Owner’s

facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

B. Provide the panelboards indicated on the Drawings complete with overcurrent protection devices and spaces.

C. This section includes panelboards and distribution panelboards and associated auxiliary equipment rated 600 V or less as shown on the drawings.

D. Refer to panel schedule and one-line power diagram on drawings for specific requirements of each panel.

1.02 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install panelboards, complete, as indicated on the Drawings and as specified herein.

B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

1.03 QUALITY ASSURANCE

A. Panels shall be factory assembled.

B. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to ensure panel access and so that clearance minimums are provided.

C. Components and installation shall be in accordance with NFPA 70, “National Electrical Code,” NEMA PBI, “Panelboards” and UL67 and UL50.

D. Panelboards and load centers shall be listed and identified for use with 75 degrees C rated conductors.

1.04 SUBMITTALS

A. Refer to Section 26 00 00 - Electrical General for submittal requirements.

B. Manufacturers Product Data:

1. Submit material Specifications and installation data for products specified under Part 2 - Products to include:
    a. Overcurrent protection devices
    b. Panelboards

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the Contract Drawings.
1. Include electrical characteristics and ratings for each panelboard with dimensions, mounting, bus material, voltage, ampere rating, mains, poles and wire connection, and any accessories. Indicate method of ground bus attachment to enclosure.
2. Include bussing diagram indicating each bussing overcurrent protection device position.
3. Provide a schedule indicating overcurrent protection device type, trip and size, poles, frame type, interrupting capacity.

1.05 SHORT CIRCUIT AND COORDINATION STUDY

A. Overcurrent protective devices shall be selectively coordinated for distribution systems serving emergency and standby loads, for faults with durations at 0.01 seconds.

B. Manufacturer of switchboards and panelboards shall provide a short circuit and coordination study for:
1. Distribution systems required to be selectively coordinated that contain circuit breakers.
2. Distribution systems containing breakers with adjustable trip settings.
3. Distribution systems requiring arc-flash analysis.

C. Where required for selective coordination purposes, the coordination study shall be included in the shop drawing submittals for the equipment.

1.06 ARC FLASH SAFETY

A. The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D, and IEEE 1584 – Guide for Performing Arc Flash Hazard Calculations.

B. Arc Flash Hazard Analysis
1. Manufacturer of panelboards shall provide an arc flash hazard analysis for the electrical distribution system. Include this study in the shop drawing submittals for the equipment.

2. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
3. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
4. The flash protection boundary and the incident energy shall be calculated and reported at all significant locations in the electrical distribution system (panelboards) where work could be performed on energized parts.
5. The arc flash hazard analysis shall include all MV, 575v, and 480v locations and locations in 240 volt and 208 volt systems rated 400 amps and above.
6. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

7. The arc flash hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
8. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
9. Arc flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.
10. The report shall indicate incident energy and flash protection boundary calculations as follows:
    a. Arcing fault magnitude
    b. Device clearing time
    c. Duration of arc
    d. Arc flash boundary
    e. Working distance
    f. Incident energy
    g. Hazard risk category
    h. Recommendations for arc flash energy reduction

C. Arc Flash Warning Labels
1. Contractor shall field-install arc flash labels on equipment that includes the available incident energy and required personnel protective equipment (PPE).
2. The vendor shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
3. The label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following information:
    a. Location designation
    b. Nominal voltage
    c. Flash protection boundary
    d. Hazard risk category
    e. Incident energy
    f. Working distance
    g. Engineering report number, revision number and issue date
4. Labels shall be machine-printed, with no field markings.
5. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings:
    a. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided.
6. Labels shall be field-installed by the engineering service division of the equipment manufacturer.

D. Arc Flash Training
1. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, shall be provided in the equipment manuals.

The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Panelboard manufacturer shall be:
   1. Siemens
   2. Square D
   3. General Electric
   4. Cutler-Hammer

2.02 GENERAL REQUIREMENTS

A. All panels and overcurrent protection devices shall be UL Listed and bear a UL Label. Where panel serves as service entrance equipment, panel shall bear a UL Label indicating suitability as service entrance equipment.

B. Panels shall be of the dead front safety type.

C. Provide panels complete with factory assembled circuit breakers or fuses connected to the bus bars in the positions shown on the panel schedules.

D. Provide all panelboards fully rated to the A.I.C. ratings noted on the schedules, but not less than 10,000 amperes for 120/208 volt. All devices in a panelboard shall be rated for the A.I.C. ratings shown for the panelboard.

2.03 BUSSING AND INTERIORS

A. All bus bars shall be copper. Main lugs and main overcurrent protection devices shall be UL approved for copper or aluminum conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain a full size grounding bus. All panelboards shall contain a full size insulated neutral bus unless otherwise indicated on the drawings.

B. The neutral and ground bus shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection.

C. Where designated on panel schedule as “space,” include all necessary bussing, device support and connections. Provide blank cover for each space.

D. Where specified or indicated on the drawings, provide sub-feed lugs adjacent to the mains or feed-through lugs opposite end of mains and increase box heights to provide additional cable bending and termination space. Lugs to be the same size and capacity as mains and rated for aluminum or copper conductor terminations.

2.04 ENCLOSURES

A. Panelboard width shall not be less than twenty inches unless indicated on the drawings (32" minimum for distribution panelboards).

B. Provide concealed captive clamping devices, concealed hinges and chrome lock for all flush mounted panels. Key all panels throughout project alike.

C. Where two section panels are required, both sections shall have fully rated bus, separate cabinets connected by conduit nipples. Interconnect sections with copper conductors with ampacity equal to rating of main bus. Route phase and neutral conductors together between panels. Provide separate trims for each section.

D. Panelboard trims for surface mounted panelboards shall be continuously hinged on one side so that when opened, wiring gutters are completely exposed.

E. Provide a label for each branch circuit, feeder, and main circuit breaker in distribution panels, permanently attached per the requirements of Section 26 00 00 - Electrical General, 2.02A.

F. Cabinets, flush or surface mounted as indicated. NEMA PB-1, Type 1 enclosure, except where the following enclosure requirements are indicated:
   1. NEMA 250, Type 3R - Raintight.
   2. NEMA 250, Type 3S - Raintight and dust tight.
   3. NEMA 250, Type 4X - Corrosion-resistant stainless steel enclosure, watertight, dust tight, and resistant to oil and coolant seepage. This type shall be used in kitchen areas.
   4. NEMA 250, Type 12 - Dust tight, dripproof, and resistant to oil and coolant seepage.

G. Enclosure shall be fabricated with galvanized steel. Trims shall have electrostatic applied ANSI gray enamel finish and adjustable indicating trim clamps for securing trim to the enclosure. Screwed-on trims shall not be acceptable. Trim shall have an angle support along the bottom serving as a support between trim and enclosure for safe installation and removal of trim.

H. Exterior Panels: Panelboards mounted outside of building shall be in NEMA type 3R enclosures. Panelboards shall have in addition to the standard specified items the following:
   1. Piano hinge
   2. Seams continuously welded
   3. Rolled lip around door and cabinet
   4. No knockouts or holes
   5. Neoprene gaskets on inside of door
   6. Stainless steel hardware
   7. Drip hood at top above door

2.05 CIRCUIT BREAKERS

A. Interrupting rating of all circuit breakers in panelboards shall have UL rating of not less than the RMS symmetrical amps indicated on the Drawings at system voltage. Series rated devices are acceptable with the following exceptions: devices used in distribution serving emergency, standby and multiple elevator loads (selective coordination).

B. Circuit breakers shall be provided with trip rating and poles as indicated on the drawings or specified herein.

C. Multi-pole breakers shall be common trip and common reset; tie handle connection between single pole breakers is not acceptable.

D. Branch circuit breakers in lighting and appliance panels shall be quick-make, quick-break, thermal magnetic type bolted to the bus. Circuit breakers in distribution type panel boards shall be bolted to the bus.

E. Provide the following special devices and accessories when indicated on the drawings or specified herein.
   1. Ground fault interrupting circuit breakers (GFI) where indicated on the drawings, or specified herein or as code requires.
   2. Provide handle lock-on device (to prevent manually turning off device without removal) for all overcurrent devices where indicated on panelboard schedules, and for those protecting circuits serving fire alarm equipment, and for those dedicated for powering emergency battery-powered unit equipment.
   3. Provide UL Listed "SWD" switching duty circuit breakers on the devices indicated on the drawings.
   4. Provide shunt trip device for electrically tripping circuit breakers indicated on the drawings.
   5. Overcurrent protective devices for fire alarm circuits shall have handles that are factory-marked in the color red.
   6. Provide arc-fault circuit breakers in all sleeping rooms, or specified herein or as code requires.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide from each flush mounted panelboard four (4) 3/4" empty conduits stubbed out above ceiling line and capped.

B. Install panelboards in accordance with NEMA PB1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less" and manufacturer's written installation instructions.

C. Mount panelboards with top circuit breaker not more than 6'-6" above finished floor.

D. Only one conductor installed under terminal of individual circuit breakers. Form and train conductors in panel enclosure neatly parallel and at right angles to sides of box. Un-insulated conductor shall not extend beyond one-eighth inch from terminal lug.

E. Do not splice conductors in panels. Where required, install junction box adjacent to panel and splice or tap conductors in box.

F. Mounting and Support
   1. Mounting
      a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. Panelboards 600 amp and larger shall be secured by a minimum of eight

(8) devices. A 1.5 inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.

b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.

c. Attach enclosure directly to masonry, concrete, or wood surfaces.

d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installation on steel structure or sheet rock walls.

G. Maintain conductor phase color code requirements described in the conductors and cables section of the specifications.

H. A typewritten branch circuit directory (based on as-built conditions) shall be provided for each panelboard and load center, permanently mounted on inside of door in a transparent, protective cover. Room number(s) or room name(s) shall be included in the circuit description in coordination with the final naming/numbering scheme for the project (e.g. "Office Receptacles" shall read "Office Receptacles – Rm. 202, 203").

I. Any circuit breaker provided with arc energy reducing maintenance switch shall be labeled "BREAKER IS PROVIDED WITH ARC ENERGY REDUCING MAINTENANCE SWITCH". Labeling shall be per the requirements of Section 26 00 00 – Electrical General 2.02A.

J. Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, "Application Guide for Ground Fault Circuit Interrupters."

K. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

L. Mounting of all panelboards and all hardware used for mounting shall be in accordance with the seismic criteria per the applicable building code.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

1.02 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install wiring devices, complete, as indicated on the Drawings and as specified herein.

B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. The following manufacturers are allowed:
   1. Hubbell
   2. Pass & Seymour
   3. Cooper
   4. Leviton
   5. Thomas & Betts/Steel City
   6. Walker/Wiremold

   When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

C. This section includes receptacles, connectors, switches, dimmers, timeclocks and coverplates.

1.03 QUALITY ASSURANCE

A. Wiring devices shall comply with applicable sections of NEMA Standard WD-1, NFPA 70, Article 100.

B. All special purpose receptacles shall be NEMA standard configuration.

C. Comparative devices by acceptable manufacturers are equal.

PART 2 - PRODUCTS

2.01 WIRING DEVICE DESCRIPTION AND MANUFACTURER

A. Single & Duplex Receptacles (20 Amp)
   1. Single or duplex type receptacle as indicated. 125V/20/A/2P/3W/G rating - NEMA - 5-20R type.
   2. Face color shall be selected by architect.
   3. Manufacturer

a. Hubbell 5362

B. GFCI Duplex Receptacles
1. Duplex, feed-thru type ground fault current interrupter receptacle with test/reset buttons. 125V/20A/2P/3W/G rating - NEMA 5-20R type conforming to UL #498, UL #943 Class A and NEMA #WD1-4.02.
2. Manufacturer
a. Hubbell GF20 Series

C. Clock/Flat Screen Receptacles
1. Single type receptacle with a recessed outlet clock hanger type mounting coverplate. 125V/15A/2P/3W/G - NEMA 5-15R type.
2. Manufacturer
a. Hubbell RR151CH Series

D. Maintained Contact Switches
1. Provide toggle operated switches SPST, DPST, 3-way or 4-way operation as indicated. 277V/20A rating, quiet type, maintained contact, and a green hexagonal ground screw or ground pigtail, and side wired.
2. Manufacturer
a. Hubbell 1221 Series (Color to match receptacles).

E. Momentary Contact Switches
1. Provide toggle or key operated switches as indicated with single circuit, 3-position center-off operation. 277V/20A rating, quiet type, momentary contact, spring loaded switch, and green hexagonal ground screw or ground pigtail, back and side wired.
2. Manufacturer
a. Hubbell HBL 155* (Color to match receptacle).

F. Maintained Contact Slider Type Switch (For Multi-Ganging with Dimmers)
1. Slide-operated switch (to match dimmer), single pole, 3-way or 4-way operation as indicated, 120/277V, 20A rating.
2. Manufacturer
a. Leviton Monet Series
b. Lutron Nova T Series

G. Illuminated Toggle Switches
1. Single pole, 3-way or 4-way, as indicated, conforming to UL #20, NEMA #WDI-3.02 and F.S. #W-S-896E. 277V/20A rating, quiet type, maintained contact, and a green hexagonal ground screw or ground pigtail, back and side wired. Red colored toggle to glow when switch is on.
2. Manufacturer
a. Hubbell HBL 1221PL

H. Weather-Resistant Receptacles
1. All 15- and 20-amp receptacles installed in damp or wet locations shall be listed weather-resistant type.

I. Tamper-Resistant Receptacles

1. All 125-volt, 15- and 20-amp receptacles in sleeping rooms shall be listed tamper-resistant receptacles.

J. Tamper-Resistant Receptacle with USB Chargers

1. Device shall include two 15-amp tamper-resistant receptacles and two 5-volt DC USB 2.0 and 3.0 compatible charging ports.
2. Where shown on drawings as ground-fault protected, device shall be wired from load-side of a GFCI receptacle.
3. Manufacturer
   a. Pass & Seymour TM826USB*CC6

2.02 COVERPLATE DESCRIPTION AND MANUFACTURER - COVERPLATES

A. Flush Mounted Interior Receptacle/Switch Coverplates
1. Single or multi-gang to match device type. Medium size (4-7/8" min.), standard depth, smooth finish with nylon material.
2. Color to match device color.
3. Coverplates in mechanical/electrical equipment rooms, apparatus bay, apparatus bay support rooms and high abuse areas shall be stainless steel, non-magnetic.
4. Manufacturer
   a. Hubbell NPJ Series (nylon)
   b. Hubbell SS Series (stainless steel)

B. Weatherproof Device Coverplates
1. Provide weatherproof “in use” cast aluminum lockable covers. Plastic covers are allowed on dwelling balconies.
   a. Hubbell WP Series
   b. Thomas & Betts Russell Stoll Series

C. Multi-Outlet Raceway
1. Product Description
   a. Two-piece rectangular surface raceway of length as prescribed. Stainless steel type 304 housing complete with all bends, fittings, couplings, caps and mounting hardware.
   b. Single 15A/125V grounding outlets UL Labeled and full length ground wire.
   c. Outlets 18" on centers starting no less than 9" from end.
   d. Maximum of six outlets per circuit. Where two or more circuits are utilized the outlets shall be on alternate circuits.
2. Manufacturers
   a. Walker/Wiremold
   b. Hubbell

2.03 MISCELLANEOUS ITEMS

A. Time Switches
1. Electronic Astronomical Schedule Type

a. 365 day scheduling, solid state, skip-a-day feature, daylight saving changeover, leap year adjusted with capacitor backup, DPDT-120V/20A rated contacts, light sensor input.
b. Acceptable Manufacturer
1) Tork DZS Series (channels as required)

B. Photoelectric Control Switches
1. Product Description
a. Raintight photoelectric self-contained control for switching.
b. Die-cast housing with adjustable sensor.
2. Manufacturers
a. AMF/Paragon
b. Tork 2100 Series

C. Lighting Contactor
1. Product Description
a. Multi-pole contactor for switching branch circuit tungsten and ballast lighting and resistant heating loads and LED drivers.
b. Number of poles as indicated (paralleling multiple contactors is acceptable), poles rated for 20 amperes @ 600V continuous duty.
c. Mechanically held contactor with coil clearing contacts, operating coil voltage to match circuit characteristics.
d. Housed in panelboard (if indicated).

D. Poke-thru Floor Devices
1. Product Description
a. Refer to drawings for specific features.
b. Device shall meet UL 514A requirements for scrubwater test standards.
2. Manufacturer
a. Hubbell
b. Walker/Wiremold
c. Thomas & Betts/Steel City

E. Single/Multiple Station Smoke Alarms: Each sleeping room shall be provided with a smoke alarm. Alarms shall be 120V (with battery back-up) with built-in evacuation horn, power-on indicator and auxiliary contact. Where more than one is installed in a dwelling unit, activation of one detector shall trigger all alarms in that unit. Alarms shall have integral alarm silencing feature.

F. Single/Multiple Station Combination Smoke/Carbon Monoxide Alarms: Each area outside of a sleeping room shall be provided with a combination smoke/carbon monoxide alarm. Alarms shall be 120V (with battery back-up) with built-in evacuation horn, power-on indicator and auxiliary contact. Where more than one is installed in a dwelling unit, activation of one detector shall trigger all alarms in that unit. Alarms shall have integral alarm silencing feature.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All dimmer circuits shall have dedicated neutrals.

B. Install decorative plates on switch, receptacle, and blank outlets when indicated.

C. Install devices and wall plates flush and level.

D. Coordinate the exact location of wiring devices with other trades and architectural features. Do not locate devices on two different architectural finishes such as half on wall tile and half on painted surface, unless noted otherwise.

E. Provide plaster rings in areas requiring them due to construction.

F. Where more than one device is indicated, arrange in gangs covered with one coverplate per manufacturer's instructions.

G. Where dimmer(s) and switch(es) are shown adjacent to one another, switch(es) shall be a maintained contact switch matching dimmer style, so that a common, multi-gang faceplate can be used.

H. Provide 6" long ground wire from grounding lug to all switches and receptacles to a screw type bonding device on the conduit or outlet box.

I. Install receptacles with grounding pin on top.

END OF SECTION 26 27 26

SECTION 26 28 16 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 26 00 00 - Electrical General.

1.02 WORK INCLUDED

A. The work under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install disconnect switches, up to 1200 amps, complete, as indicated on the Drawings and as specified herein.

B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

C. This section includes fuses.

D. This section includes individually mounted enclosed switches used for the following:
   1. Service disconnecting means.
   2. Feeder and branch-circuit protection.
   3. Motor and equipment disconnecting means.

1.03 SUBMITTALS

A. Product Data: For each type of switch and fuse accessory, and component indicated, include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

1.04 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 NEMA AB 1, NEMA KS 1 and UL 98.

C. Comply with NFPA 70.

D. Comply with NEMA FU 1.

E. Source Limitations: Provide fuses from a single manufacturer.

1.05 COORDINATION

A. Coordinate layout and installation of switches and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer of fusible and non-fusible switches shall be Cutler-Hammer, General Electric, Siemens or Square D Company.

B. Manufacturer of fuses shall be Bussman, Gould Shawmutt or Littelfuse.

2.02 ENCLOSED SWITCHES

A. All disconnect switches shall be heavy duty type with lockable handles.

B. Enclosed, non-fusible switch: NEMA KS 1.

C. Enclosed, fusible switch, 800 A and smaller: NEMA KS 1 with clips to accommodate specified fuses and interlocked with cover in closed position.

D. Furnish and install all safety type disconnecting switches indicated on the drawings, specified or required by the National and/or State Electrical Code. Switches shall be externally operable. If the size is not shown on the drawings, the subcontractor shall size the disconnect switch in accordance with name plate data of the equipment they serve.

E. Coordinate with other trades that may provide unit mounted disconnect switches prior to submission of bids.

F. Safety type disconnecting switches shall be heavy duty, 600 volt industrial type with quick-make, quick-break mechanism and interlocking cover which normally cannot be opened when the switch is in the “ON” position. Switches shall be single throw. Fusible switches shall be equipped with fuse clips to receive Bussman fuses. Switches shall have provision for padlocking in the open and closed positions. The operating handle shall be visible in either the on or off position.

G. All fused disconnect switches mounted above 6'-6" shall be hook stick operable.

2.03 INTERIOR

A. Switch blades shall be operated by rotating shaft directly connected to the operating handle mechanism. Switch blades shall be clearly visible in the open position. All switches shall have clear shields over the incoming line lugs. Line shields shall be attached in such a way that switch blade covers or arc shields need not be removed for line installation. Line and load lugs shall be front removable and suitable for copper or aluminum, 60/75 degree wire through 200A sizes, 75 degrees C wire for 400-800A sizes.

B. Current limiting type RK1 dual element time delay fuses shall be furnished and installed as necessary; rating shall be shown on drawing.

2.04 ENCLOSURES

A. All switches shall have NEMA type 1 general purpose enclosures unless indicated otherwise on the drawings. NEMA 3R covers shall be side hinged rather than top hinged. NEMA 1 and 3R switches through 200A sizes shall tangential knockouts for conduit line up against walls. NEMA 12 enclosures through 200A sizes shall be UL Listed for conversion to NEMA 3R usage by opening a factory provided drain hole. All types of enclosures shall have metal nameplates affixed to the cover to show the switch type and rating and clearly indicate "ON" and "OFF" direction of handle movement. Provide hubs on all NEMA 4, 4X, or 3R type disconnects.

B. Provide manufacturer's standard factory applied finish unless otherwise indicated.

C. Provide phenolic engraved nameplate for disconnect switches.

2.05 CONTROL POLE

A. Where required a direct action interlock or control pole shall be affixed to the switch base in such a manner as to operate positively and only with the opening and closing of the switch power poles.

2.06 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Examine elements and surfaces to receive enclosed switches for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Locate disconnect switches to provide working clearance and full accessibility as required by the National Electrical Code.

B. Mounting and Support

1. Mounting
    a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. A 1.5-inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.

b. Enclosure shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified. Mount with operating handle at 60" AFF, unless other height is indicated.
c. Attach enclosure directly to masonry, concrete, or wood surfaces.
d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device.
e. Where enclosure is not indicated on a wall or structure, construct a metal channel (strut) free standing frame secured to floor, pad, or other appropriate building structure.

C. Do not splice conductors in enclosure. Where required install junction box or wireway adjacent to enclosure and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specifications and do not exceed.

3.03 CONNECTIONS

A. Install equipment grounding connections for switches with ground continuity to main electrical ground bus.

B. 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.

3.04 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

B. Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.

END OF SECTION 26 28 16

SECTION 26 32 13 - EMERGENCY STANDBY GENERATOR SYSTEM AND SWITCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide an emergency standby power system for supply of power in the event of failure of normal supply, consisting of a liquid cooled engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter. System shall comply with NFPA 110 requirements, and the latest requirements of the U.S. Environmental Protection Agency (EPA).

B. Generator shall be rated as follows: 150kW, 180KVA at 35% maximum voltage dip. The generator tank shall have a minimum run time capacity of 24 hours at full load.

C. Provide automatic operation from automatic transfer switch(es) described within this specification so that the system comes on line fully automatically, and after restoration of utility automatically retransfers load to normal power, shuts down the generator and returns to readiness for another operating cycle.

1.02 CODES AND STANDARDS

A. The emergency generator system shall conform to the requirements of the following:
   1. NFPA 110 – Emergency and Standby Power Systems
   2. NFPA 30 – Flammable and Combustible Liquids Code
   3. NFPA 37 – Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines

1.03 MANUFACTURER QUALIFICATIONS

A. This system is designed based upon products of Cummins, and no equivalents will be accepted. The manufacturer must be regularly engaged in the production of engine-alternator sets and associated controls for a minimum of ten years, so there is one source of supply and responsibility. The complete engine generator set system shall be supplied by the manufacturer's authorized distributor only.

PART 2 - PRODUCTS

2.01 ENGINE

A. The prime mover shall be a liquid cooled, **diesel fueled** turbo-charged/after cooled engine of 4-cycle design. The engine shall be a single piece, cast block. Multiple blocks combined are not acceptable. The engine will utilize in-cylinder combustion technology, as required, to meet the applicable EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178-D2 Emissions Cycle at specified ekW/bHP

rating. Utilization of the "Transition Program for Equipment Manufacturers" (also known as "Flex Credits") to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder.

B. The engine is to be cooled with a unit-mounted radiator, fan, water pump, and closed coolant recovery system providing visual diagnostic means to determine if the system is operating with a normal engine coolant level. The radiator shall be designed for operation in **104 degrees Fahrenheit** (40 degrees Celsius) ambient temperature.

C. The intake air filter with replaceable element must be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter with internal bypass and replaceable elements. Engine coolant and oil drain extension must be provided to outside the mounting base for cleaner and more convenient engine servicing. A fan guard must be installed for personnel safety.

D. The engine shall have a battery charging DC alternator with a transistorized voltage regulator. Remote 2-wire starting shall be by a solenoid shift, electric starter.

E. Engine speed shall be governed by an **electronic** governor to maintain alternator frequency within **0.5%** from no load to full load alternator output. Steady state regulation is to be + **or - 0.25%**.

A. The engine fuel system shall be designed for operation on No. 2 diesel fuel. A secondary fuel filter, water separator, manual fuel priming pump and fuel shut-off solenoid and all piping must be installed at the point of manufacture. Upon turnover of the project to the Owner, the fuel tank shall be full.

B. Sensing elements to be located on the engine for low oil pressure shutdown, high coolant temperature (low coolant level shutdown), overspeed shutdown, overcrank shutdown. These sensors are to be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.

C. The engine shall have an engine-mounted, thermostatically-controlled jacket water heater to aid in quick starting. It will be of adequate wattage as recommended by the engine manufacturer. The Contractor shall provide proper branch circuit from normal utility power source.

2.02 ALTERNATOR

A. The alternator shall be a 4-pole revolving field type, for 3-phase, 60 Hz (voltage indicated on Drawings) with a brushless exciter. The stator shall be directly connected to the engine flywheel to ensure permanent alignment. The generator shall meet temperature rise standards for UL 1446 Class H or better varnish. All leads must be extended into the AC connection panel. The alternator shall be protected by an automatic reset field circuit breaker, or over excitation sensing voltage regulator.

B. Load acceptance shall be 100% of nameplate kW rating and meet the requirements of NFPA 110. The engine-generator set shall be so designed that instantaneous voltage dip upon

application of nameplate kW/kVA shall not exceed 30% with recovery to stable operation within 10 seconds. Sustained voltage dip data is not acceptable.

C. A solid state voltage regulator designed and built by the engine-generator set manufacturer must be used to control output voltage by varying the exciter magnetic field to provide + **or - 1%** regulation during stable load conditions. Should an extremely heavy load drop the output frequency, the regulator shall have a voltage drop of 4 volts/hertz to maximize motor starting capability. The frequency at which this drop operation begins must be adjustable, allowing the generator set to be properly matched to the load characteristics ensuring optimum system performance.

D. The voltage regulator must contain a limiting circuit to prevent output voltage surges in excess of 110% of rated voltage during generator set operation. On a loss of the sensing signal, the voltage regulator must shutdown to prevent an overvoltage condition from occurring. A voltage regulator that can go into a full field condition is unacceptable. A rheostat shall provide a minimum of + or - 10% voltage adjustment from the rated value.

E. A NEMA 1 panel that is an integral part of the generator set must be provided to allow the installer a convenient location in which to make electrical output connections. An isolated neutral lug must be included by the generator set manufacturer to ensure proper sizing.

F. The electric plant shall be mounted with vibration isolators on a welded steel base which shall permit suitable mounting to any level surface.

G. Terminal lugs shall be factory-installed for load-side feeder connections.

2.03 CONTROLS

A. All engine alternator controls and instrumentation shall be designed, built, wired, tested and shock mounted in a NEMA 1 enclosure to the engine-generator set by the manufacturer. It shall contain panel lighting and a fused DC circuit to protect the controls. It shall provide true RMS sensing to ensure AC metering accuracy to within +/- 1% of rated AC voltage (L-L and L-N) and current.

B. The engine-generator set shall contain a complete engine start-stop control which starts the engine on closing contacts and stops the engine on opening contacts. A cyclic cranking limiter shall be provided to open the starting circuit after five attempts if the engine has not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service. The engine controls shall also include a 3-position selector switch with the following positions: RUN/AUTO/STOP. A red annunciator lamp shall be energized when the switch is not in auto.

C. Safety shutdown monitoring system shall include solid state engine monitor with individual lights and one common external alarm contact indicating the following conditions: Overcrank shutdown, Overspeed shutdown, High Coolant Temperature (Low Coolant Level shutdown), Low Oil Pressure shutdown. Monitoring system shall include lamp test switch or engine control switch for manual reset of tripped conditions. Engine RPM is to be monitored by an independent permanent magnet sensor. If there is a failure in this circuit, the engine must shut down immediately and illuminate an overspeed condition.

D. Engine control panel instrumentation shall consist of an oil pressure gauge, coolant temperature gauge, DC ammeter and an engine run hour meter located on the unit control panel. Alternator instrumentation must include analog or digital meters to indicate output voltage, amperage, kW, kVA, PF and frequency.

E. Provide the following items installed at the factory:
   1. Pre-alarms for low coolant temperature, high water temperature and low oil pressure must be provided to anticipate possible problems before the system becomes inoperative. Yellow lights labeled on the control panel will illuminate should the associated parameter be exceeded.
   2. Engine battery voltage is to be monitored to detect abnormal voltage levels. A light labeled on the control panel will illuminate should a low voltage condition be experienced.
   3. One alarm horn to actuate upon engine fault shutdown.
   4. Emergency stop button to immediately shut down the engine upon actuation.

2.04 MISCELLANEOUS EQUIPMENT

A. The following equipment is to be installed at the engine- generator set manufacturer's facility:
   1. Exhaust silencer(s) shall be provided of the size as recommended by the manufacturer and shall be critical grade. The silencer(s) shall have a flexible, seamless, stainless steel exhaust connection and rain cap. All components must be properly sized to assure operation without excessive back pressure when installed.
   2. Provide an automatic dual rate battery charger manufactured by the engine-generator set supplier. The automatic equalizer system shall monitor and limit the charge current to 10 amps. The automatic battery charger shall be rated no less than 10 amps. The charger must have a maximum open circuit voltage of 35 volts and be protected against a reverse polarity connection. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.
   3. A heavy duty, lead acid battery set shall be provided by the generator set manufacturer of adequate voltage and amperage capacity to start and operate the engine. Provide all intercell and connecting battery cables as required.
   4. Weather Protective Enclosure: The engine-generator set shall be factory enclosed in a heavy gauge steel enclosure constructed with corner posts and powder coated baked finish. The enclosure is to have large, easily opened doors to allow access to the engine, alternator and control panel. Each door is to be fitted with stainless steel, lockable hardware with identical keys. Padlocks do not meet this specification. Enclosure shall be rated for 130 mph wind gusts.

B. The following equipment is to be provided by the engine- generator set manufacturer and shipped loose with the unit:
   1. Provide a remote annunciator panel for wall mounting. The panel shall have an ALARM switch that when activated silences the audible alarm. A TEST switch must be included to verify the lights are functional. The following alarms shall be included for the remote annunciator:
      a. Overcrank
      b. Low Coolant/Water Temperature
      c. High Coolant/Water Temperature Pre-Alarm

d. High Coolant/Water Temperature Shutdown
e. Low Oil Pressure Pre-Alarm
f. Low Oil Pressure Shutdown
g. Overspeed
h. Low Fuel Alarm
i. Control Switch Not In Auto
j. Provide a minimum of four (4) spare lights for other potential alarms.

2. Provide a manual breakglass station located on the weatherproof enclosure for shutdown of the generator. Station shall be appropriately labeled.

PART 3 - AUTOMATIC TRANSFER SWITCH

3.01 SCOPE

A. Furnish and install the 4-pole fully automatic transfer switch(es) with amperage, voltage, and withstand rating as shown on the plans. Each automatic transfer shall consist of a double throw power transfer switch mechanism and a microprocessor controller to provide fully automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

3.02 CODES AND STANDARDS

A. The automatic transfer switch(es) and controls shall conform to the requirements of:
1. UL 1008 – Standard for Transfer Switch Equipment
2. IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment
3. NFPA 70 – National Electrical Code
4. NFPA 110 – Emergency and Standby Power Systems
5. IEEE Standard 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
6. NEMA Standard ICS10-1993 (formerly ICS2-447) – AC Automatic Transfer Switches
7. UL 508 Industrial Control Equipment

3.03 ACCEPTABLE MANUFACTURERS

A. Automatic transfer switch(es) shall be based on ASCO 7000 Series. Other acceptable manufacturers shall be Russell.

3.04 MECHANICALLY HELD TRANSFER SWITCH

A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency.

B. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.

C. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

D. The ATS shall be provided with fully rated overlapping neutral transfer contacts. The neutrals of the normal and emergency power sources shall be connected together only during the transfer and retransfer operation and remain connected together until power source contacts close on the source to which the transfer is being made. The overlapping neutral contacts shall not overlap for a period greater than 100 milliseconds. Neutral switching contacts which do not overlap are not acceptable.

3.05 MICROPROCESSOR CONTROLLER

A. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.

B. All customer connections shall be wired to a common terminal block to simplify field-wiring connections.

C. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
1. IEEE472 (ANSI C37.90A) Ring Wave Test
2. ENC55011 1991 Class A Conducted and Radiated Emission
3. EN61000-4-2 Electrostatic Discharge Immunity, Direct Contact & Air Discharge
4. EN61000-4-3 Radiated Electromagnetic Field Immunity
5. EN61000-4-4 Electrical Fast Transient Immunity
6. EN61000-4-5 Surge Immunity
7. ENV50141 HF Conducted Disturbances Immunity

3.06 ENCLOSURE

A. The ATS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.

3.07 STANDARD FEATURES

A. A three position momentary-type test switch shall be provided for the test/automatic/reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.

B. A set of DPDT gold-flashed contacts rated 10 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed, when the ATS is connected to the emergency source.

D. LED indicating lights (16 mm industrial grade, type 12) shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

E. LED indicating lights (16 mm industrial grade, type 12) shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal and emergency sources, as determined by the voltage sensing trip and reset settings for each source.

F. An inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO Feature 27.

G. Engine Exerciser: The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to seven different exercise routines. For each routine, the user shall be able to:
   1. Enable or disable the routine.
   2. Enable or disable transfer of the load during routine.
   3. Set the start time,
      - time of day
      - day of week
      - week of month (1st, 2nd, 3rd, 4th, alternate or every).
   4. Set the duration of the run.

   At the end of the specified duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. A 10-year life battery that supplies power to the real time clock in the event of a power loss will maintain all time and date information.

H. System Status: The controller LCD display shall include a "System Status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key a maximum of two (2) times. This screen shall display a clear description of the active operating sequence and switch position. For example,
   Normal Failed
   Load on Normal
   TD Normal to Emerg
   2min15s

   Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.

I. Data Logging: The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:
   1. Event Logging
      a. Data and time and reason for transfer normal to emergency
      b. Data and time and reason for transfer emergency to normal
      c. Data and time and reason for engine start
      d. Data and time engine stopped

e. Data and time emergency source available
f. Data and time emergency source not available

2. Statistical Data
   a. Total number of transfers
   b. Total number of transfers due to source failure
   c. Total number of days controller is energized
   d. Total number of hours both normal and emergency sources are available

3.08 TRANSITION FEATURES

A. The transfer switch shall be open-transition type

3.09 BYPASS ISOLATION SWITCH

a. A two-way bypass-isolation switch shall provide manual bypass of the load to either source and permit isolation of the automatic transfer switch from all source and load power conductors. All main contacts shall be manually driven.

b. Power interconnections shall be silver-plated copper bus bar. The only field installed power connections shall be at the service and load terminals of the bypass-isolation switch. All control interwiring shall be provided with disconnect plugs.

c. Separate bypass and isolation handles shall be utilized to provide clear distinction between the functions. Handles shall be permanently affixed and operable without opening the enclosure door. Designs requiring insertion of loose operating handles or opening of the enclosure door to operate are not acceptable.

d. Bypass to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the load when bypassing are not acceptable. The bypass handle shall have three operating modes: "Bypass to Normal," "Automatic," and "Bypass to Emergency." The operating speed of the bypass contacts shall be the same as the associated transfer switch and shall be independent of the speed at which the manual handle is operated. In the "Automatic" mode, the bypass contacts shall be out of the power circuit so that they will not be subjected to fault currents to which the system may be subjected.

e. The isolation handle shall provide three operating modes: "Closed," "Test," and "Open." The "Test" mode shall permit testing of the entire emergency power system, including the automatic transfer switches with no interruption of power to the load. The "Open" mode shall completely isolate the automatic transfer switch from all source and load power conductors. When in the "Open" mode, it shall be possible to completely withdraw the automatic transfer switch for inspection or maintenance to conform to code requirements without removal of power conductors or the use of any tools.

f. When the isolation switch is in the "Test" or "Open" mode, the bypass switch shall function as a manual transfer switch.

g. Designs requiring operation of key interlocks for bypass isolation or ATSs which cannot be completely withdrawn when isolated are not acceptable.

3.10 ACCESSORIES

A. Provide two double throw contacts that operate when emergency source voltage is present at the switch terminals, ASCO accessory 18B.

B. Provide two double throw contacts that operate when normal source voltage is present at the switch terminals, ASCO accessory 18G.

C. Provide digital metering for local and remote (MODBus) annunciation, ASCO accessory 85L, with the following metered quantities:
   1. Current, per phase RMS and neutral (if applicable)
   2. Current Unbalance %
   3. Voltage, phase-to-phase and phase-to-neutral
   4. Voltage Unbalance %
   5. Real power, per phase and 3-phase total
   6. Apparent power, per phase and 3-phase total
   7. Reactive power, per phase and 3-phase total
   8. Power factor, 3-phase total and per phase
   9. Frequency
   10. Accumulated Energy (MWH, MVAH, and MVARH)

3.11 CONTROLLER DISPLAY AND KEYPAD

A. A 4-line, 20-character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:
   1. Nominal line voltage and frequency
   2. Single or three phase sensing
   3. Operating parameter protection
   4. Transfer operating mode configuration

   (Open transition, Closed transition, or Delayed transition)

   All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.12 VOLTAGE, FREQUENCY AND PHASE ROTATION SENSING

A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Sources	Dropout/Trip	Pickup/Reset
Undervoltage	N&E,3Ø	70 to 98%	85 to 100%
Overvoltage	N&E,3Ø	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below drop-out

B. Repetitive accuracy of all settings shall be within 0.5% over an operating temperature range of -20 degrees C to 60 degrees C.

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

D. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).

E. Source status screens shall be provided for both normal and emergency to provide digital readout of voltage on all 3 phases, frequency, and phase rotation.

3.13 TIME DELAYS

A. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 24 VDC power supply.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.

C. Two time delay modes (which are independently adjustable) shall be provided on retransfer to normal. One time delay shall be for actual normal power failures and the other for the test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

D. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.

E. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control.

The controller shall have the ability to activate an adjustable 0 to 5 minute time delay in any of the following modes:

1. Prior to transfer only
2. Prior to and after transfer
3. Normal to emergency only
4. Emergency to normal only
5. Normal to emergency and emergency to normal
6. All transfer conditions or only when both sources are available

F. The controller shall also include the following built-in time delays for optional Closed Transition and Delayed Transition operation:

1. 1 to 5 minute time delay on failure to synchronize normal and emergency sources prior to closed transition transfer.
2. 0.1 to 9.99 second time delay on an extended parallel condition of both power sources during closed transition operation.

3. 0 to 5 minute time delay for the load disconnect position for delayed transition operation.

G. All time delays shall be adjustable in 1 second increments, except the extended parallel time, which shall be adjustable in .01 second increments.

H. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port.

3.14 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans.

B. The ATS shall be UL Listed in accordance with UL 1008 and be labeled in accordance with that standard's 1.5 and 3-cycle long-time ratings. ATSs which are not tested and labeled with 1.5 and 3-cycle (any breaker) ratings and have series or specific breaker ratings only are not acceptable.

3.15 SERVICE REPRESENTATION

A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

C. The automatic transfer switch(es) shall be supplied by the generator set distributor in order to establish and maintain a single source of system responsibility and coordination.

PART 4 - MISCELLANEOUS

4.01 FACTORY TESTING

A. Before shipment of the equipment, the engine-generator set shall be tested under rated 0.8 PF load for performance and proper functioning of control and interfacing circuits. A factory test report shall be made available upon request. Tests shall include:
   1. Verifying all safety shutdowns are functioning properly.
   2. Both no-load and full-load steady state voltage checks shall be tested and measured line to line and speed (frequency) checks. Line-to-line current at rated voltage shall also be tested and measured.

4.02 OWNER'S MANUALS

A. **Three (3) sets** of Owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

4.03 INSTALLATION

A. The Contractor shall install the complete electrical generating system including all fuel connections in accordance with the manufacturer's recommendations as reviewed by the Engineer.

B. The Contractor shall furnish to the Owner a manufacturer tank chart with inches-to-gallon conversions. The Contractor shall mount a laminated copy of the chart inside the generator module for use by the delivery operator.

4.04 SERVICE TESTING

A. Generator shall be programmable for weekly automatic exercising. Each week the generator shall start up and run for at least 30 minutes with no load. Once a month, the generator shall run the same as above; however, under full load.

4.05 SERVICE

A. Supplier of the electric plant and associated items shall have permanent service and parts facilities in this trade area. These facilities shall comprise a permanent force of factory trained service personnel on 24-hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the Owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

4.06 WARRANTY

A. The standby electric generating system components, complete engine-generator set and automatic transfer switch shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five years. Such defective parts shall be repaired or replaced at the manufacturer's option. In addition, all labor for the replacement of these parts for the engine-generator set and transfer switch will be covered for the first two years. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable and must be covered by the engine manufacturer. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate parts, service and warranty support.

4.07 CHECKOUT & STARTUP

A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to check out the completed installation and to perform an initial startup inspection to include:
   1. Ensuring the engine starts (both hot and cold) within the specified time.
   2. Verification of engine parameters within specification.
   3. Set no load frequency and voltage.
   4. Test all automatic shutdowns of the engine-generator.

5. Perform a full load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load supplemented with load banks. Test shall be per NFPA 110-2002 Paragraph 5-13.2.5.

4.08 SUBMITTALS

A. Provide complete sets of Engineering Submittals for approval prior to production release, showing all components, in addition to the engine, generator and automatic transfer switch. Submittals shall include complete system interconnection wiring diagrams and manufacturer's warranty form indicating compliance with these specifications.

4.09 SUBSTITUTIONS

A. The emergency power system has been designed to the specified manufacturer's electrical and physical characteristics, including the equipment sizing, spacing, mounts, electrical wiring, ventilation equipment, fuel and exhaust components. Should any substitutions be made, the Contractor shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs which may result from such substitutions. Alternate equipment suppliers shall furnish equipment submittals 14 days prior to bid date for approval to bid.

As part of the submittals, the substitute manufacturer shall supply as a minimum engine, alternator, control panel and automatic transfer switch wiring diagrams and schematics. A separate list of all printed circuit boards with part numbers and current pricing must also be included.

END OF SECTION 26 32 13

SECTION 26 41 13 - LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. The work covered by this section of the specifications consists of the design, labor, materials and items of service required for the completion of a functional and unobtrusive lightning protection system as approved by the Engineer, and in strict accordance with this section of the specifications and any applicable Contract Drawings.

B. If any departure from the Contract Drawings or Submittal Drawings covered below are deemed necessary by the Contractor, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer.

C. The following specifications and standards of the latest issue form a part of this specification: 1) Lightning Protection Institute Installation Code LPI 175; 2) UL Standard 96A; 3) ANSI C2-81; 4) NFPA 780.

1.02 QUALITY ASSURANCE

A. The lightning protection system shall conform to the requirements of the Lightning Protection Institute and NFPA Standards for Lightning Protection Systems. The LPI System Certification shall be furnished and submitted.

B. The system to be furnished under this specification shall be UL Listed by an approved and fully certified manufacturer in good standing of the Lightning Protection Institute. All material specified for this work is manufactured by Thompson Lightning Protection, Inc., East Coast Lightning, Erico or equal.

1.03 SHOP DRAWINGS

A. Complete shop drawings shall include details and drawings showing the type, size and locations of all air terminals, bonding plates, down conductors, conductor fasteners, masonry anchors and ground rods shall be submitted to the Engineer for approval prior to start of work.

B. Samples and pertinent catalog data shall be submitted to the Engineer for approval upon request.

C. Drawings must bear the stamp of the certified master installer designer.

D. Copy of certifications of designer must be submitted.

PART 2 - PRODUCTS

2.01 STANDARD

A. All equipment used in this installation shall be UL inspected, approved and properly labeled.

B. All equipment shall be new, the product of a single manufacturer as outlined above, and of a design and construction to suit the application where it is used in accordance with accepted industry standards and Code requirements.

C. All materials shall conform to UL-96A Class I requirements.

2.02 EQUIPMENT

A. All materials shall be the minimum size and weight in accordance with LPI and NFPA requirements.

B. All vertical conductors shall be copper, and roof-mounted horizontal conductors shall be copper or aluminum (conductors must be galvanically compatible with adjoining surfaces).

C. Air terminals shall be copper or aluminum (selection to be galvanically compatible with adjoining surfaces), and shall project 10" minimum above the object to be protected. Locate and space according to LPI and NFPA requirements. Length and diameter of terminals shall be dependent upon material used and installation class.

D. Air terminal bases shall have bolt pressure cable connections and shall be securely mounted with stainless steel screws or bolts. Bases on built-up tar and gravel roofs shall be secured properly and shall have a minimum surface contact area of 18.5 sq. inches. Crimp type connectors at bases are not acceptable.

E. Ground rods shall be a minimum of 3/4" in diameter and 10'-0" long. Exothermic connections shall be used for below grade installations of rods and cables.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installation shall be accomplished by an experienced installer who is a Certified Master Installer of the LPI manufacturer as listed above or his authorized LPI Certified Master Installer representative.

B. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible.

C. Ground rods shall be installed 3'-0" from building foundation. Resistance to ground at each ground rod shall not exceed 5 ohms.

D. The number of down conductors, size, type and location of grounds and building connections shall be as required by the standards of this specification. A complete cable system with related air terminals, splices, and bonds, etc., shall be used on the roof. Down conductors shall be installed in 1-1/4" PVC conduit concealed in or behind building walls or columns. Down conductors shall be connected to ground rods not less than 18" below the bottom of the floor slab.

E. Copper equipment shall not be connected to aluminum surfaces except by means of an LPI approved bimetal transition fitting. Lead coating is not to be accepted as a bimetal transition.
   1. Metals acceptable for use with copper:
      a. Nickel, brass, tin, lead, stainless steel, and monel.
   2. Metals acceptable for use with aluminum:
      a. Magnesium, zinc, galvanized steel, stainless steel, lead, and wrought iron.

F. Bending radius of lightning protection conductors shall not be less than 8", nor shall any bend form an angle less than 90 degrees.

G. Metal equipment, piping or other objects within 6' of a lightning conductor shall be connected to the lightning protection system.

H. Underground and intermediate ground loop conductors shall be copper.

3.02 COORDINATION

A. All roof mounted mechanical equipment shall be bonded to lightning protection grid.

B. It shall be the responsibility of the lightning protection installer to interconnect with other building ground systems, including electrical, water and telephone systems and also to ensure that proper arresters have been installed on the power service.

C. Lightning protection installer shall obtain approval from the Architect and the roofing contractor regarding method of fastening conductors and air terminals to the roof, parapet and appurtenances prior to installation.

3.03 COMPLETION

A. The lightning protection installer shall secure and deliver the LPI System Certification to the project manager for delivery to the Owner upon completion of the installation, in addition to the UL master label certification.

B. The Contractor shall also submit copies of as-built shop drawings along with the completed LPI Certified System Application.

END OF SECTION 26 41 13

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES (SPD)

PART 1 - GENERAL

1.01 DESCRIPTION

A. These specifications describe the electrical and mechanical requirements for a hybrid high-energy power conditioning filter incorporating surge protective devices and high-frequency electrical line noise filtering. The specified unit shall provide effective high-energy surge protection, surge current diversion, high-frequency attenuation, and line control in ANSI/IEEE C62.41.1-2002 environments connected on the load side of the facility's meter or main overcurrent device. The unit shall be connected in parallel with the facility's wiring system.

1.02 QUALITY ASSURANCE

A. The requirements of the following standards shall become a part of this Specification by reference:
   1. American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41.1-2002, C62.41.2-2002, and C62.45-2002)
   2. Canadian Standards Association (CSA)
   3. Federal Information Processing Standards Publication 94 (FIPS PUB 94)
   4. National Electrical Manufacturers Association (NEMA)
   5. National Fire Protection Association (NFPA 70 (NEC), 75 and 78)
   6. Underwriters Laboratories Inc. (UL 1449 3rd Edition and 1283)

   The unit shall be UL and cUL 1449 3rd Edition Listed as a Surge Protective Device.

B. Acceptable Manufacturers
   1. Current Technology
   2. Thor Systems

C. Testing: The unit shall be thoroughly factory-tested before shipment. Testing of each unit shall include but shall not be limited to quality assurance checks, MCOV and clamping voltage verification tests.

D. Warranty: The manufacturer shall provide a minimum 5-year warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

E. Submittal Documentation: Documentation of unit's UL 1449 3rd Edition Voltage Protective Rating (VPR) shall be included as required product data submittal information. Manufacturer shall make available upon request certified documentation of applicable Location Category Testing in full compliance with ANSI/IEEE C62.41.1-2002, C62.41.2-2002, and C62.45-2002 Guidelines. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the specified unit. Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

PART 2 - PRODUCTS

2.01 GENERAL MATERIALS REQUIREMENT

A. The unit shall provide all modes of protection: line to neutral, line to ground, and neutral to ground.

B. High Frequency Tracking Filter: The unit shall include a UL1283 high-frequency extended range tracking filter. The filter shall reduce fast rise-time, high-frequency, error producing transients and electrical line noise to harmless levels, thus eliminating disturbances which may lead to system upset.

C. Unit Status Indicators: The unit shall include solid-state, long-life, externally mounted LED visual status indicators that indicate the status of MOV fusing.

D. Transient Counter: Front cover mounted transient counter (LCD or LED) shall totalize surges for all modes.

E. Nominal discharge current rating shall be I_n 20 kA.

F. Minimum SPD fault current ratings shall be 100Kaic.

PART 3 - APPLICATIONS

3.01 SERVICE ENTRANCE/MAIN DISTRIBUTION APPLICATIONS

A. The following table will indicate appropriate model numbers based on the electrical system ampacity. Surge current ratings are based on the Site Shield Risk Assessment Spreadsheet (TSI 067 3gSSH/r3).

B. SPDs connected to service equipment shall be listed as a type 1 SPD per UL1449 3rd Edition and shall have integral disconnect switch, and shall be connected to bus on the load side of the main switch.

SERVICE ENTRANCE/MAIN DISTRIBUTION APPLICATIONS					
Manufacturers' Models			Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
Current Tech	Thor Systems	Emerson/ APT		Per Mode	Per Phase
TG 300	TSrc 300	460 30	4000 – 6000A	300	600
TG 250	TSrc 250	460 30	2000 – 3000A	250	500
TG 200	TSrc 200	460 20	1200 – 1600A	200	400
TG 150	TSrc 150	460 15	600 – 1000A	150	300
TG 100	TSrc 100	460 10	125 – 400A	100	200

PART 4 - EXECUTION

4.01 INSTALLATION

A. Install wiring connection to distribution system as indicated on the Drawings. Wiring length should be kept to an absolute minimum (3' or less) and be as straight as possible.

B. Wire sizes to Service Entrance/Main Distribution SPD should be 4#6, 1#6 G - 1" conduit.

C. Wire sizes to Panelboard and Branch Panel SPD should be as indicated 4#10, 1#10G – ¾" conduit.

END OF SECTION 26 43 13

SECTION 26 51 00 - LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the lighting system requirements.

B. All fixtures shall be current source, provided with lamps ready to use.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Refer to another division for the ceiling systems.

B. Lighting system shall be coordinated with the ceilings.

1.03 SUBSTITUTIONS

A. Substitution/value requests shall be accompanied by complete manufacturers data with model numbers, cut sheets with options indicated, cutsheets of lamps for each individual fixture, cutsheets of each driver for each individual fixture, a full photometric report, and complete point-by-point calculations for all of interior. For exterior lighting, a computer generated point by point calculation shall be provided.

B. All substitution requests shall be submitted in completion to Engineer at least 10 days prior to bid date.

C. Pricing for lighting fixtures shall be separate from pricing for lighting controls (occupancy sensors, relay controls, dimming).

PART 2 - PRODUCTS

2.01 LED Drivers

A. Electronic driver for LED fixtures shall include the following:

1. Rated for a minimum 50,000 hours of life
2. Class A sound rating
3. Total Harmonic Distortion: 15% or less

2.02 LAMPS

A. LED lamps shall be of type, size and voltage as scheduled on the Drawings.

2.03 LIGHTING FIXTURES

A. Letter designations beside outlet symbols on Drawings correspond to letter designations in Lighting Fixture Schedule.

B. Recessed fixtures, where used in an insulated ceiling, shall be equipped with thermal protection and shall bear the UL Label indicating the suitability for such use.

C. Lens material for recessed fixtures shall be 100% virgin acrylic.

D. Site lighting poles shall meet or exceed a 130mph wind gusts.

E. Direct burial pole bases shall be required for site lighting poles.

F. Recessed lighting fixtures installed in the building thermal envelope (e.g. attic) shall be IC rated and labeled with enclosures that are sealed and gasketed to limit air leakage between conditioned and non-conditioned spaces.

2.04 LED LUMINAIRES

A. UL or ETL Listed and labeled

B. Minimum 80CRI

C. 5 Year warranty minimum

D. Tested to LM-79, LM-80 and TM-21 standards

E. Lumen Maintenance: 70% lumen output for 50k hours

F. Power Factor: 0.9

PART 3 - EXECUTION

3.01 LIGHTING FIXTURES

A. Provide lighting fixtures at all locations indicated by distinctive symbols or notes on the Drawings.

B. Lighting fixtures shall be secured to ceiling grid with clips or screws and two #12 steel wires mounted to opposite corners of light fixture secured to structure.

C. Locations of lighting fixtures on the electrical drawings are approximate. Refer to Architectural reflected ceiling plan for actual locations of fixtures and mounting heights.

D. Lighting fixtures installed in plaster and stucco ceiling shall have plaster frame and shall be of the flanged type.

E. Fixtures recessed in concealed-spline tile and in gypsum board ceilings shall be flanged.

F. Surface or recessed fixtures in or on plastered ceilings shall be supported from pieces of support channel spanning across the main supporting channels and shall not depend on the metal lath for support.

G. Each recessed lighting fixture shall have a trim to match the type of ceiling (exposed grid, metal panel, etc.) in which it is being installed, except where noted otherwise on the plans.

H. Each lighting fixture recessed in a concrete wall shall have a junction box or wiring compartment provided inside the fixture housing. Provide conduit access into the fixture concealed.

I. Contractor is responsible for total LED system functionality. LED drivers, boards, and controllers must be compatible with each other and work as a complete system.

END OF SECTION 26 51 00

SECTION 27 00 00 – COMMUNICATIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 General Requirements shall be considered a part of this section and shall have the same force as if printed herein full.

1.02 QUALITY ASSURANCE

A. Specifications, Standards and Codes: All work shall be in accordance with the following:

1. The 2014 edition of the National Electrical Code (NFPA 70)
2. The 2012 edition of the Life Safety Code (NFPA 101).
3. Building Industry Consulting Service International (BICSI)
4. Telecommunications Distribution Methods Manual (TDMM)
5. American National Standards Institute (ANSI)
6. The National Electrical Safety Code (NESC)
7. The National Electrical Safety Code (ANSI C-2).
8. National Electrical Manufacturers Association (NEMA)
9. Telecommunications Industries Association (TIA)
10. Electronic Industries Association (EIA)
11. Institute of Electrical & Electronics Engineers (IEEE)
12. Underwriters Laboratories (UL)
13. American Standards Association (ASA)
14. Federal Communications Commission (FCC)
15. Occupational Safety and Health Administration (OSHA)
16. American Society of Testing Material (ASTM)
17. Americans with Disabilities Act (ADA)
18. Local city and county ordinances governing electrical work
19. In the event of conflicts, the more stringent provisions shall apply.

1.03 SCOPE

A. The work to be performed under this section of the Specifications shall include all labor, material, equipment and tools required for the complete installation of the work indicated on the Drawings and as specified herein.

B. All materials, that are a part of the Communications Infrastructure and necessary to its proper operation, but not specifically mentioned and shown on the Drawings, shall be furnished and installed without additional charge.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the engineer shall be notified of the discrepancy.

1.04 WORK INCLUDED

The Communications Infrastructure installed and work performed under this Division of the Specifications shall include but not necessarily be limited to the following:

A. Firestopping

B. Communications Pathways, Underground Ducts and Raceways

C. Commissioning

D. Surge Protection

E. Access Control

F. Underground Raceway Excavation, Backfill and Compaction

G. Concrete Work for Duct Banks, Maintenance Holes, Handholes, Vaults and Restoration

1.05 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the General Requirements and are applicable to Division 27 - Communications:

1. Provide: As used herein shall mean "furnish, install and test (if applicable) complete."
2. Infrastructure: As used herein shall mean cable, conduit, raceway, cable tray or j-hooks with all required boxes, fittings, connectors, and accessories; completely installed.
3. Work: As used herein shall be understood to mean the materials completely installed, including the labor required.

1.06 DRAWINGS

A. Drawings are generally diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. The Contractor shall coordinate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, the Contractor shall so advise the Engineer and secure approval before proceeding with such work.

B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall provide shop drawings, equipment location drawings, foundation drawings, and any other data required to locate the concealed conduit before the floor slab is poured.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

D. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.

E. The Contractor shall not reduce the size or number of conduit runs indicated on the Drawings without the written approval of the Engineer.

F. Any work installed contrary to Contract Drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.

G. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from Architectural plans unless otherwise noted.

H. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be furnished at the Contractor's expense.

I. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Notify the Engineer of any discrepancies.

J. Review all architectural drawings for modular furniture.

K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall," "shall be," "as indicated on the Drawings," "in accordance with," "a," "the" and "all are intended" shall be supplied by inference.

1.07 SUBMITTALS

A. Provide submittals for the following systems:

1. Firestopping
2. Communications Pathways, Underground Ducts and Raceways
3. Commissioning
4. Surge Protection
5. Access Control
6. Underground Raceway Excavation, Backfill and Compaction
7. Concrete Work for Duct Banks, Maintenance Holes, Handholes, Vaults and Restoration

B. Submit for approval, details of all materials, equipment and systems to be furnished. Work shall not proceed without the Owner and/or the Project Manager's approval of the submitted items. Three (3) copies of the following shall be submitted:

1. Submittals for individual systems and equipment assemblies that consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered, reviewed or stored, and such submittals will not be returned except at the request and expense of the Contractor.

2. Contractor shall generate shop drawings. Modify reviewed and accepted shop drawings to include revisions based upon completion of work. Submit shop drawings with record drawings on hard copy.
3. Shop drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details and any other details not included in the construction drawings.

C. Any materials and equipment listed that are not in accordance with Specification requirements may be rejected.

D. The approval of material, equipment, systems and shop drawings is a general approval subject to the Drawings, Specifications and verification of all measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. The Contractor shall carefully check and correct all shop drawings prior to submission for approval.

E. Materials List: Submit a complete materials list indicating all equipment to be provided as part of this section.

F. Samples: Submit selection and verification samples of finishes, colors, and textures as requested.

G. Complete details of equipment mounting configuration.

H. Manufacturing assembly and testing procedures and forms.

I. Installation testing and check out procedures and forms to be used by the Contractor and Architect and/or Consultant.

J. The conduit plans, equipment plans, riser diagrams, block diagrams and details are to be submitted in the latest version of MicroStation or AutoCAD, and shall be submitted on a minimum of 'D' size drawings. Documents submitted in any other manner including marked up sets of the bid documents shall receive immediate rejection and will not be reviewed. A complete set of as-built documents will be issued at the completion of the project inclusive of CAD files on CD.

K. Submittals issued in a manner inconsistent with the requirements of these specifications shall receive immediate rejection and will not be reviewed. Submittals issued containing materials, products and/or equipment that is not listed or approved by addendum shall receive immediate rejection and will not be reviewed.

1.08 QUALITY ASSURANCE

A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.

B. Equipment shall bear labels attesting to Underwriters Laboratories, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if

so directed by the Owner, be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.09 CONTRACTOR QUALIFICATIONS

A. The Contractor shall have total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications. The Contractor shall be a company specializing in the design, fabrication and installation of integrated communications systems.

B. Communications Systems specified shall be installed under the direction of a qualified Contractor. Qualification requirements shall include submittal by the Contractor to the Architect of the following:

1. List of previous projects of this scope, size and nature; including names and sizes of projects, description of work, time of completion and names of contact persons for reference.
2. Shall certify that they are manufacturer-authorized for work to be performed.

C. Contractor must employ at least one (1) full-time Registered Communications Distribution Designer (RCDD).

1.10 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate Communications work with that of other sections as required ensuring that the entire communications work will be carried out in an orderly, complete and coordinated fashion.

1.11 SITE INVESTIGATION

A. Prior to submitting bids of the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems, shall be restored to their original condition before the completion of this project.

1.12 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

1.13 RENOVATIONS AND ADDITIONS

A. All work that would adversely affect the normal operation of the other portions of the Owner's property shall be done at a time other than normal working hours. Normal working hours shall be considered 8 a.m. to 5 p.m. Monday through Friday.

B. Prior to submitting bids on the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project.

C. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original and operating condition. Remove all equipment indicated to be demolished, including outlets, devices, raceways and support structures.

D. Care shall be exercised in the removal and storage of equipment indicated to be relocated or removed and reused. Prior to placing back into service, equipment shall be cleaned and marred or chipped paint surfaces touched-up.

E. Provide all coring, cutting and patching to existing walls, floors, etc., required for the removal of existing work or the installation of new work.

1.14 OPERATION & MAINTENANCE MANUALS

A. The Contractor shall furnish three (3) sets of operational and maintenance manuals for all systems furnished. The manuals shall include component lists, instructions for care, operation instructions, instructions for ordering replacement equipment and personnel to contact for warranty work.

1.15 APPROVALS

A. Deviations from this specification must be documented in writing to the Architect and Engineer at least twenty-one (21) business days prior to the bid date.

B. Complete catalogue data, product specifications and technical information on alternative equipment must be provided including all associated cost savings or additions, including but not limited to equipment, equipment installation, power wiring and materials, programming, documentation and project management.

1.16 DELIVERY & HANDLING

A. General: Comply with Division 1 Product Requirements Section.

B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials and equipment in an area protected from harmful weather conditions and at temperature conditions recommended by manufacturer. After initial installation, protect equipment from exposure to dust, dirt, paint and other contaminants.

1.17 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings.

B. Scheduling: Coordinate taking field measurements, fabrication schedule and deliveries with construction progress schedule to avoid construction delays.

1.18 WARRANTY

A. Manufacturer's Warranty: All equipment and labor provided under this section is warranted for two (2) years from Substantial Completion or System Commissioning, whichever occurs first.

B. During the warranty period, the Contractor shall perform quarterly preventative maintenance inspections on all installed equipment.

C. Nothing in the above warranty shall apply to material which has been misused or abused as follows: neglect by the owner, defects or damage caused by work or failure of work by others, ordinary wear or normal equipment adjustment.

D. Additionally, any unauthorized modifications, repairs or tampering shall constitute termination of the warranty.

1.19 TRAINING

A. The Contractor shall provide four (4) hours of on-site training for operational purposes and forty (40) hours of training for maintenance purposes at the turnover of the project.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.

B. All changes necessary to accommodate the substituted equipment shall be made at the Contractor's expense, and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.

C. If substitutions are made in lieu of device specified; form, dimension, design and profile shall be submitted to the Engineer for approval.

D. Submit request for approval of substitute materials in writing to the Architect at least ten days prior to bid opening.

2.02 MATERIALS

A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.

B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.

C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.

D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.

E. Components of an assembled unit need not be products of the same manufacturer, but must offer a certified end-to-end solution.

F. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

G. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 - EXECUTION

3.01 EXAMINATION OF CONDITIONS

A. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, and the referenced standards.

C. In the event of a discrepancy, immediately notify the Project Manager.

D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.02 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.

B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.

C. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.

D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents.

E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.03 ACCESS TO EQUIPMENT

A. Equipment shall be installed in location and manner that will allow access for maintenance and inspection.

B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.

C. Where the Project Manager determines that the Contractor has installed equipment not accessible for operation and maintenance, equipment shall be removed and reinstalled as directed by the Project Manager, at no additional cost to the Owner. "Accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.04 CLEANING

A. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of packing material and debris caused by communications work.

B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

C. General: Upon completion of the work, remove excess dust & debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.

3.05 COMPLETION

A. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.

B. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Owner.

3.06 TESTING AND VERIFICATION

A. See specific Division 27 sections for testing parameters of sub-systems.

B. The Contractor shall verify that requirements of this Specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.

C. Verification by inspection includes examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the Specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the Owner.

D. The Contractor shall verify by demonstrations and/or tests that the requirements of this Specification have been met. The Contractor shall demonstrate that the communications systems, components and subsystems meet Specification requirements in the "as-installed" operating environment during the "System Operation Test." The Contractor shall measure and record temperature, humidity and other environmental parameters.

E. The Contractor shall schedule and coordinate the final acceptance tests. The Contractor shall provide necessary instruments, labor and materials required for tests. Provide equipment manufacturer's technical representative and qualified technicians.

F. The Contractor shall satisfy all items detailed in the final acceptance check-off list (punch list). The list shall be a complete representation of specified installation requirements. At the time of final acceptance punch list items shall be corrected until the system is found to be acceptable to the Owner and the Project Manager.

END OF SECTION 27 00 00

SECTION 27 05 10 - FIRESTOPPING FOR COMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 - Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Firestopping for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. The successful vendor shall meet or exceed all requirements described in this document and on the drawings.

1.02 SUBMITTALS

A. Provide product data from manufacturer's specifications.

1.03 WORK INCLUDED

A. The work included under this Specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install all firestopping materials.

PART 2 - PRODUCTS

2.01 APPROVED PRODUCTS

A. Approved Firestopping Manufacturer(s)

1. Flamestopper Thru-Wall Fitting - Wiremold Company (Firestop Devices)
2. Unique Firestop Products (Firestop Devices)
3. STI Firestop Products (Firestop Devices, Putties, Caulks, Sealants, etc.)
4. Hilti (Putties, Caulks, Sealants, etc.)

2.02 TYPES OF PRODUCTS

A. Sealants

1. Intumescent Firestop Sealants and Caulks
2. Latex Firestop Sealant
3. Acrylic Water-Based Sealant

4. Silicone Firestop Sealants and Caulks
5. Firestop Putty
6. Firestop Collars
7. Wrap Strips
8. 2-Part Silicone Firestop Foam
9. Firestop Mortar
10. Firestop Pillows
11. Elastomeric Spray
12. Accessories:
13. Forming/Damming Materials: Mineral fiberboard or other type as per manufacturer recommendation

B. Firestop Devices

1. Thru-Wall Fitting (Flamestopper by Wiremold)
   a. The firestop device box shall be constructed of 16 gage G90 steel.
   b. The firestop device intumescent block shall be constructed of a graphite base material with expansion starting at 375°F and an unrestrained expansion between 6 to 12 times. The intumescent block shall be held securely by the box in order to prevent tampering and damage during installation.
   c. The firestop device shall have doors which can be adjusted to prevent materials from penetrating the device if the device is empty or completely full. The doors shall be constructed of 16 gage G90 steel with No. 10-32 screws use to adjust opening size.
   d. The firestop device shall be available for 2" and 4" trade size EMT conduit.
   e. The firestop device shall be available in safety yellow powder coat, custom colors and an unpainted galvanized finish.
2. Threaded Firestop Device (Unique Firestop Products)
   a. Threaded steel sleeve device incorporating flat washers secured by threaded device shall be installed around cables. The device shall be available in 1, 2 and 4-inch sizes. Maximum diameter of the wall penetration for 1, 2 and 4-inch sizes shall be 1-1/4, 2-7/16 and 4-1/2 inches respectively.
3. Smooth Firestop Device (Unique Firestop Products)
   a. Smooth steel sleeve device incorporating flat washers secured by sliding compression couplers. The device shall be available in 1, 2 and 4-inch sizes. Maximum diameter of the wall penetration for 1, 2 and 4-inch sizes shall be 1-1/4, 2-7/16 and 4-1/2 inches respectively.
4. Split-Sleeve Firestop Device (Unique Firestop Products)
   a. Threaded steel sleeve halves incorporating split couplings and slotted washers to fit the specific diameter of the opening. The device shall be available in 1, 2 and 4-inch sizes. Maximum diameter of the wall penetration for 1, 2 and 4-inch sizes shall be 1-1/4, 2-7/16 and 4-1/2 inches respectively.
5. Fire Rated Cable Pathway (STI EZ-PATH)
   a. Fire rated cable pathway device modules shall be comprised of steel raceway with intumescent foam pads allowing 0-100 percent cable fill.

2.03 UL CLASSIFICATION

A. Thru-Wall Fitting - The firestop device for use in through-penetration firestop systems shall have been examined and tested by Underwriters Laboratories Inc. to UL1479 (ASTM E 814) and bear the U.S. and Canadian UL Classification Mark.

B. Threaded, Smooth and Split-Sleeve Firestop Devices - Firestopping sealants and devices shall be used together as a firestop system. All firestop systems shall bear a UL Classification system number. UL Classification system numbers are as follows:

1. Threaded Firestop System
   a. Block Wall - W-J-3049
   b. Dry Wall - W-L-3138
2. Threaded Firestop System (Vertical)
   a. Slab - F-A-3010
3. Smooth Firestop System
   a. Block Wall - W-J-3048
   b. Dry Wall - W-L-3137
4. Split-Sleeve Firestop System
   a. Block Wall - W-J-3047
   b. Dry Wall - W-L-3136

2.04 FIRESTOPPING SYSTEMS

A. Thru-Wall Fitting Firestop System:

1. The device shall be classified for use in one-, two-, three, and four-hour rated gypsum, concrete and block walls and provide a maximum L rating of six cfm. The devices shall also been tested by Underwriters Laboratories Inc. to UL2043 and determined to be suitable for use in air handling spaces.

B. Threaded, Smooth and Split-Sleeve Firestop Systems:

1. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
2. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
3. For joints, must be tested to UL 2079 with movement capabilities equal to those of the anticipated conditions.

C. Firestopping materials and systems must be capable of closing or filling through-openings created by 1) the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials, or 2) deflection of sheet metal due to thermal expansion (electrical & mechanical duct work).

D. Firestopping material shall be asbestos and lead free and shall not incorporate nor require

the use of hazardous solvents.

E. Firestopping sealants must be flexible, allowing for normal pipe movement.

F. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.

G. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

PART 3 - EXECUTION

3.01 CONDITIONS REQUIRING FIRESTOPPING

A. General

1. Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.

B. Through-Penetrations

1. Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.

C. Membrane-Penetrations

1. Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet the requirements of third party time/temperature testing.

D. Construction Joints/Gaps

1. Firestopping shall be provided between the edges of floor slabs and exterior walls, between the tops of walls and the underside of floors, in the control joint in masonry walls and floors and in expansion joints.

E. Smoke-Stopping

1. As required by the other sections, smoke-stops shall be provided for through-penetrations, membrane-penetrations, and construction gaps with a material approved and tested for such application.

3.02 EXAMINATION

A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Verify that environmental conditions are safe and suitable for installation of firestop products.

C. Verify that all pipes, conduit, cable, and other items that penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.03 INSTALLATION

A. General

1. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
3. Unless specified and approved, all insulation used in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
4. Seal holes and penetrations to ensure an effective smoke seal.
5. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
6. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
7. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.

B. Dam Construction

1. When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.

3.04 FIELD QUALITY CONTROL

A. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.

B. Follow safety procedures recommended in the Material Safety Data Sheets.

C. Finish surfaces of firestopping that are to remain exposed in the completed work to a uniform and level condition.

D. All areas of work must be accessible until inspection by the applicable Code Authorities.

E. Correct unacceptable firestops and provide additional inspection to verify compliance with this Specification.

3.05 CLEANING

A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

B. Leave finished work in a neat and clean condition with no evidence of spill-overs or damage to adjacent surfaces.

3.06 IDENTIFICATION

A. Refer to Section 27 05 53 - Identification for Communications Systems for labeling details.

END OF SECTION 27 05 10

SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 - Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Pathways for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. The successful vendor shall meet or exceed all requirements described in this document and on the drawings.

1.02 SUBMITTALS

A. Provide product data from manufacturer's specifications.

1.03 WORK INCLUDED

A. The work included under this specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install complete conduit system.
2. Furnish and install all communications outlet boxes.
3. Furnish and install all pull boxes.
4. Furnish and install all cable hangers.
5. Furnish and install all tie wraps/Velcro straps.

PART 2 - PRODUCTS

2.01 APPROVED PRODUCTS

A. Rigid/Intermediate Conduit Manufacturer(s)

1. Allied
2. Triangle
3. Wheatland
4. Youngstown

B. Non-Metallic (PVC) Manufacturer(s)

1. Carlon

2. Georgia Pipe Company
3. Or Approved Equal

C. Electrical Metallic Tubing (EMT) Manufacturer(s)

1. Allied
2. Triangle
3. Wheatland
4. Youngstown

D. Electrical Non-Metallic Tubing (ENT) Manufacturer(s)

1. Carlon
2. Or Approved Equal

E. EMT Fittings Manufacturer(s)

1. Thomas & Betts
2. Steel City
3. Or Approved Equal

F. ENT Fittings Manufacturer(s)

1. Carlon
2. Or Approved Equal

G. Innerduct/Inner-Conduit Channel Manufacturer(s)

1. Carlon
2. Endot Industries
3. MaxCell
4. Petroflex
5. Eastern

H. Metallic Communications Outlet Box Manufacturer(s)

1. Steel City
2. Raco
3. Or Approved Equal

I. Non-Metallic Communications Outlet Box Manufacturer(s)

1. Thomas & Betts
2. Carlon
3. Or Approved Equal

J. Pull Box Manufacturer(s)

1. Hoffman
2. OZ Gedney

3. Quazite
4. Or Approved Equal

K. Approved Cable Hanger Manufacturer(s)

1. MonoSystems – The Hook Series
2. Erico Products – Caddy Series
3. B-Line
4. Or Approved Equal

L. Approved Tie Wrap/Velcro Strap Manufacturer(s)

1. Thomas & Betts
2. Panduit
3. Or Approved Equal

2.02 CONDUIT

A. Rigid and Intermediate Conduit

1. Rigid conduit, intermediate conduit, couplings, locknuts, bushings, elbows and connectors shall be standard thread. All materials shall be steel. Set screw or non-threaded fittings are not permitted.

B. Non-Metallic (PVC) Conduit

1. Non-metallic conduit shall be heavy wall, Schedule 40 PVC.
2. Couplings and connectors for non-metallic conduit shall be of the same material and be the product of the same manufacturer of the conduit furnished.

C. Electrical Metallic Tubing (EMT)

1. Electrical metallic tubing (EMT), couplings and connectors shall be steel. Malleable iron, pressure-cast or die-cast fittings are not permitted.
2. Fittings for 2" EMT and smaller shall be steel set screw type, except where otherwise noted. Fittings for 2.5" and larger shall be steel set screw type with two (2) screws for connectors and four (4) screws for couplings. All connectors shall be insulated throat type.

D. Electrical Non-Metallic Tubing (ENT)

1. ENT shall be a pliable, non-metallic raceway manufactured of the same PVC material used for rigid non-metallic conduit.
2. Fittings and outlet boxes shall be designed for use with ENT and listed by Underwriters Laboratories.

E. Conduit Support

1. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose and sized appropriately for the conduit type and diameter.

Support individual conduits 1-1/2 inch and smaller with 1/4 inch threaded steel rods and use 3/8 inch rods for 2 inch and larger.

2. Conduit support channels shall be 14 gauge galvanized (or equivalent treatment) channel sized for the amount of conduit to be supported. Channel suspension shall be 3/8" threaded steel rods. Attach suspension rods to structure with swivel type connectors. Conduit straps shall be spring steel type compatible with channel.
3. Conduit straps shall be single hole cast metal type or two hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.

F. Innerduct/Inner-Conduit Channel

1. Innerduct shall be corrugated plastic equipped with pull-string or mule tape.
2. Inner-conduit channel (MaxCell) shall be 3-channel with each channel equipped with mule tape.
3. See Drawings for innerduct/inner-conduit channel (MaxCell) details.

2.03 METALLIC COMMUNICATIONS OUTLET BOXES

A. Metallic outlet boxes and device covers shall be galvanized steel not less than 1/16" thick.

B. The dimensions of the metallic outlet box shall be 4" x 4" square with a minimum depth of 2-1/8".

C. Metallic outlet boxes shall be equipped with single device covers (or two-device covers where needed). Where installed in plaster, gypsum board, etc., covers shall be raised to compensate for the thickness of the wall finish.

D. Where metallic outlet boxes are to be empty for future use, blank coverplates shall be used.

2.04 NON-METALLIC COMMUNICATIONS OUTLET BOXES

A. The non-metallic outlet box shall be thermoplastic and be rated according to the space it occupies.

B. The dimensions of the non-metallic outlet box shall be approximately 4" x 4" square with a minimum depth of 2-1/8".

C. Non-metallic outlet boxes shall be equipped with single device covers. Covers shall be raised to compensate for the thickness of the wall finish.

D. Where non-metallic outlet boxes are to be empty for future use, blank faceplates shall be used.

2.05 PULL BOXES

A. Pull boxes shall be constructed of galvanized steel with flat, removable covers fastened with plated steel screws.

B. Pull boxes shall be equipped with keyhole screw slots in the cover to permit removal of the cover without extracting the screws.

C. Pull boxes shall have provisions for grounding.

2.06 CABLE HANGERS

A. J-Hooks

1. J-hooks shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables. J-hook shall be cULus Listed.
2. J-hooks shall have flared edges to prevent damage while installing cables.
3. J-hooks sized 1-5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.

B. Adjustable Non-Continuous Cable Support Sling

1. Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair balanced twisted pair cables; rated for indoor use in non-corrosive environments. Rated to support Category 5 and higher cable, or optical fiber cable. Cable support sling shall be cULus Listed.
2. Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.
3. Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces.

2.07 TIE WRAPS AND VELCRO STRAPS

A. Tie Wraps and Velcro Straps

1. Cables shall be fastened to support structures with tie wraps/Velcro straps.
2. Tie wraps/Velcro straps installed in air handling spaces must be plenum rated.
    a. Non-plenum Tie Wrap color shall be black.
    b. Plenum Tie Wrap color shall be red.
    c. Non-plenum Velcro strap color shall be black.
    d. Plenum Velcro strap color shall be red.

PART 3 - EXECUTION

3.01 PENETRATIONS

A. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw upon approval of the structural engineer of record for the base of building. Pneumatic hammer, impact electric, hand or manual hammer type drills shall not be allowed, except where permitted by the Project Manager as required by limited working space. X-ray all floor penetrations accordingly.

B. Holes shall be located so as not to affect structural sections such as ribs or beams.

C. Holes shall be laid out in advance. The Project Manager shall be advised prior to drilling through structural sections, for determination of proper layout.

D. Structural Penetrations: Where conduits, wireways and other raceways pass through fire partitions, fire walls or walls and floors provide a code compliant effective barrier against the spread of fire, smoke and gases.

E. All penetrations where conduit is not used shall be sleeved.

F. No gaps or rough edges shall be allowed between wall and conduit/sleeve.

3.02 CONDUIT SYSTEM

A. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the Drawings.

B. Leave all empty conduits with a 200 pound test nylon cord pull line.

C. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.

D. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel.

E. Install conduit with wiring, including homeruns as indicated on the Drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a contract change. Deviations shall be made only where necessary to avoid interferences and when approved by Engineer by written authorization.

F. Conduit shall be run parallel or at right angles to existing walls, ceilings, and structural members.

G. Attach backbone conduits larger than one-inch trade diameter to or from structure on intervals not exceeding twelve feet with conduit beam clamps, one-hole conduit straps or trapeze type support.

H. Where conduits must pass through structural members obtain approval of Architect.

I. Install all conduits or sleeves penetrating or routed within rated firewalls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.

J. Provide expansion and deflection coupling where conduit passes over a building expansion joint.

K. Service entrance conduits and feeder conduits in direct contact with earth shall be schedule 40, heavy wall PVC. All service entrance conduit elbows shall be galvanized rigid steel. Service entrance conduits installed exposed or concealed in walls or above ceilings shall be galvanized rigid steel (G.R.S.) or intermediate metal conduit (IMC). Service entrance conduits shall be installed "outside" of the building as defined by the N.E.C. Provide concrete encasement where required or as indicated on Drawings.

L. All other conduit, unless specified herein, shall be electrical metallic tubing (EMT) or electrical non-metallic tubing (ENT). PVC conduit is not allowed in exposed or concealed areas, but only within concrete.

M. Conduit Installations Within Slab/Floor

1. Conduit shall be run following the most direct route between points.
2. Conduit shall not be installed in concrete where the outside diameter is larger than 1/3 of the slab thickness.
3. Conduits shall not be installed within shear walls unless specifically indicated on the Drawings. Conduit shall not be run directly below and parallel with load bearing walls.
4. Protect each metallic conduit installed in concrete slab or conduits 1-1/2 inch and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape.
5. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
6. Provide expansion fittings in all conduits where length or run exceeds 200 feet or where conduits pass through building expansion joints.
7. Install all conduits penetrating or routed within rated fire floors to maintain the fire rating of the floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.
8. Conduits installed within concrete floor slabs which are in direct contact with grade or which penetrate the building roof shall be galvanized rigid steel (G.R.S.), intermediate metal conduit (I.M.C.) or Schedule 40, heavy wall PVC.

N. Communications cables shall not occupy conduits with power cables.

O. Metallic conduits shall be grounded in accordance with ANSI/TIA-607-B.

P. Conduit runs shall not have more than two (2) 90-degree bends between pull points.

Q. Communications conduit system shall contain no condulets (also known as an LB).

R. Rigid metal conduit (RMC) or intermediate metal conduit (IMC) shall be used for entrance conduits that exceed 50 feet into the building.

S. Horizontal Conduits

1. Support horizontal conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, backboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit

clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.

2. For runs that total more than 100 feet in length, insert pull boxes so that no segment between boxes exceeds the 100 feet limit.
3. Each horizontal home-run conduit can serve from one (1) to three (3) outlet boxes. For one (1) outlet box, a 3/4" conduit shall be used, minimum. For two (2) outlet boxes, a 1" conduit shall be used, minimum. For three (3) outlet boxes, a 1-1/4" conduit shall be used, minimum.

3.03 COMMUNICATIONS OUTLET BOXES

A. Exact locations of the outlet boxes shall be coordinated with the electrical contractor and other trades.

B. The approximate locations of the outlets are indicated on the Drawings. The exact locations shall be determined at the building. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

C. Orientation of outlet boxes (horizontal or vertical) shall be as indicated on the architectural elevations.

D. Install all outlet boxes in finished areas flush with the wall. Maintain 1/4" or less space between outlet box front and finished wall surface.

E. Outlet boxes shall be firmly anchored in place and shall not depend on the coverplate to hold it secure to the wall.

F. Outlet boxes installed back-to-back in fire-rated walls shall be separated horizontally by a minimum of 24".

3.04 PULL BOXES

A. Pull boxes shall be secured, independent of the conduit entries into the box. Pull boxes shall be secured to the building structure. In ceiling applications, pull boxes shall not be supported with ceiling wires.

B. Conduits entering pull boxes shall connect to pull boxes using die-cast zinc connectors.

C. Pull boxes shall be free from burrs, dirt and debris.

D. Pull boxes shall be installed in accordance with ANSI/TIA-569-B.

E. Pull boxes shall be grounded in accordance with ANSI/TIA-607-B.

3.05 CABLE HANGERS

A. Installation and configuration shall conform to the requirements of ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 & ANSI/TIA-569-B, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer's installation instructions.

B. Install cables using techniques, practices, and methods that are consistent with Category 5e or higher requirements and that supports Category 5e or higher performance of completed and linked signal paths, end to end.

C. Install cables without damaging conductors, shield, or jacket.

D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.

E. Pull cables without exceeding cable manufacturer's recommended pulling tensions. Use pulling means that will not damage media.

F. Do not exceed load ratings specified by manufacturer.

G. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.

H. To avoid electromagnetic interference (EMI), pathways shall provide minimum clearances of four feet from motors or transformers, one foot from conduit and cables used for electrical power distribution, and five inches from fluorescent lighting. Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.

3.06 TIE WRAPS AND VELCRO STRAPS

A. Tie wraps/Velcro straps shall be installed around cables at intervals of 12" minimum.

B. Tie wraps shall secure cables to cable trays using an "X" pattern.

C. Do not over-cinch cables.

3.07 IDENTIFICATION

A. Refer to Section 27 05 53 - Identification for Communications Systems for labeling details.

END OF SECTION 27 05 28

SECTION 27 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 - Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Underground Ducts and Raceways for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. The successful vendor shall meet or exceed all requirements described in this document and on the drawings.

1.02 SUBMITTALS

A. Provide product data from manufacturer's specifications.

1.03 WORK INCLUDED

A. The work included under this specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install complete conduit system.
2. Furnish and install all maintenance holes/handholes.
3. Furnish and install all conduit plugs/caps.

PART 2 - PRODUCTS

2.01 APPROVED PRODUCTS

A. Rigid/Intermediate Conduit Manufacturer(s)

1. Allied
2. Triangle
3. Wheatland
4. Youngstown

B. PVC/HDPE Conduit Manufacturer(s)

1. Carlon
2. Georgia Pipe Company

3. FiberTel
4. Or Approved Equal

C. Innerduct/Inner-Conduit Channel Manufacturer(s)

1. Carlon
2. Endot Industries
3. MaxCell
4. Petroflex

D. Marker Tape Manufacturer(s)

1. William Frick & Associates
2. Or Approved Equal

E. Approved Maintenance Hole/Handhole Manufacturer(s)

1. Quazite
2. Old Castle
3. Pencell
4. Or Approved Equal

F. Approved Conduit Plug/Cap Manufacturer(s)

1. Jack Moon
2. Or Approved Equal

2.02 CONDUIT SYSTEM

A. PVC conduit for concrete encasement shall be Type DB, UL Labeled for 90 degrees C cables. Fittings shall be Type DB, solvent type, and from the same manufacturer as the conduit.

B. Concrete shall have a minimum strength of 2,500 psi at 28 days.

C. PVC conduit for direct burial shall be Schedule 40, UL Labeled for 90 degrees C cables. Fittings shall be Schedule 40, solvent type, and from the same manufacturer as the conduit.

D. Rigid and Intermediate Conduit

1. Rigid conduit, intermediate conduit, couplings, locknuts, bushings, elbows and connectors shall be standard thread. All materials shall be steel. Set screw or non-threaded fittings are not permitted.
2. Galvanized rigid steel conduit shall be hot dipped galvanized inside and outside, in 10 foot lengths and threaded on both ends. Fittings and bushings shall be threaded, cast or malleable iron, and hot dipped galvanized inside and outside.

E. Non-Metallic Conduit

1. Non-metallic conduit shall be heavy wall, Schedule 40 PVC/HDPE.
2. Couplings and connectors for non-metallic conduit shall be of the same material and be the product of the same manufacturer of the conduit furnished.

F. Conduit Support

1. Conduit straps shall be single-hole cast metal type or two hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.

G. Innerduct/Inner-Conduit Channel

1. Innerduct shall be non-corrugated PVC equipped with mule tape.
2. Inner-conduit channel (MaxCell) shall be 3-channel with each channel equipped with mule tape.
3. See Drawings for innerduct/inner-conduit channel (MaxCell) details.

H. Marker Tape

1. Marker tape shall be detectable, orange for communications, and labeled to indicate the type of circuit buried below.

2.03 MAINTENANCE HOLES/HANDHOLES

A. Maintenance Holes

1. Maintenance holes shall be pre-cast or cast in place concrete with a strength of 3,500 psi at 28 days, and steel reinforced.
2. Maintenance holes shall include a cast iron frame with cover, a hot dipped galvanized steel ladder, and hot dipped galvanized pulling eyes embedded in the concrete opposite each duct entrance and in the floor beneath the cover.
3. Maintenance holes shall be equipped with grounding busbar.
4. Maintenance holes shall be equipped with racking for cable storage.
5. Ground splices and connections at maintenance holes shall be exothermic welds, copper or bronze compression ground fittings, or bolted compression ring lugs.
6. The cover for maintenance holes shall have the lettering, "COMMUNICATIONS."

B. Handholes

1. Handholes shall be non-conductive and shall not require grounding for safety. Handholes shall be unaffected by freeze/thaw and resistant to sunlight and chemicals. Handholes shall be pre-cast polymer concrete, heavy duty rated and bottomless.
2. Handholes shall be equipped with racking for cable storage.
3. Handholes shall have the word "COMMUNICATIONS" molded in the cover by the manufacturer. The cover shall be attached with penta-head stainless steel bolts.
4. Handholes shall be able to withstand 10,000 lbs minimum.
5. See Drawings for handhole dimensions and locations.

2.04 CONDUIT PLUGS/CAPS

A. Conduit Plugs/Caps

1. Conduit plugs shall provide a watertight seal at expose ends of conduits.
2. Conduit plugs shall be conduit size specific.
3. Triplex and Quadplex duct plugs shall provide a watertight seal between the conduit and innerduct(s).
4. Simplex duct plugs shall provide a watertight seal between the innerduct and the cable that occupies it.
5. TDUX inflatable bladders shall be used to seal conduits equipped with MaxCell.

PART 3 - EXECUTION

3.01 CONDUIT SYSTEM

A. Excavation and Backfill

1. Contractor shall call underground utilities locator company before digging.
2. Barricades shall be provided around open holes and trenches. Temporary bridges shall be provided over trenches cut through major sidewalk routes. Major sidewalk routes shall not be closed to pedestrian traffic.
3. Barriers shall be provided to protect landscaping adjacent to the excavation area.
4. When rocks, concrete or other debris are encountered during excavation, remove completely.
5. Where sidewalk sections must be removed for installation of underground ducts, remove the sidewalk sections completely from joint to joint.
6. Where asphalt must be removed for installation of underground ducts, saw cut the asphalt in two, straight, parallel lines.
7. Backfill excavations in 6-inch layers and mechanically compact to 98 percent compaction.
8. Excavated materials may be used as backfill only if the backfill is sand or clean dirt that is free of rocks and debris over 3/4" in diameter.
9. In landscaped areas, backfill and mechanically compact to a depth of 6 inches below grade.
10. Backfill the last 6 inches with clean topsoil. Reseed lawn areas.
11. Restore concrete sidewalks and asphalt.
12. The Contractor shall perform all excavation to install the electrical work herein specified and as indicated on Drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and others excavation and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut.
13. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting equipment or

installation and replace with specified material for a minimum of 12" below invert of equipment or installation.

14. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and rammed until the installation has a cover of not less than the adjacent ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 95% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off.

B. Duct Banks

1. Duct banks shall be sloped downward toward maintenance holes/handholes and away from buildings a minimum of 6 inches per 100 feet. Duct banks shall not route water from maintenance holes handholes into buildings. Duct banks shall not contain traps between maintenance holes/handholes where water may accumulate.
2. Directional changes in duct banks shall be made with 20' minimum radius bends. Duct banks and direct buried ducts shall be supported on undisturbed soil or on piers extending down to undisturbed soil.
3. Where power and communications duct banks run in parallel, they shall be separated by a minimum of 12 inches.
4. Prior to concrete encasement, ducts, reinforcing steel and ground wires shall be secured with nonmetallic straps or cable ties to nonmetallic duct spacers at intervals not exceeding 8 feet. Duct spacers shall be sized for the ducts being held, and shall provide the minimum spacing between ducts required for concrete flow and by the NEC. Duct spacers shall be anchored to the ground using nonmetallic bands and stakes.
5. Duct banks shall have a minimum of 3 inches of concrete cover on all sides.
6. Where duct banks enter maintenance holes or buildings, they shall be constructed as integral to the wall.
7. Duct bank shall extend to the inside surfaces of the walls, and the duct bank reinforcing shall be integrated with the wall reinforcing.
8. Bell ends shall be provided on ducts where the ducts enter maintenance holes or buildings.
9. Direct buried ducts and fittings shall have bend radii greater than the minimum bend radii of the cables enclosed, and shall not be smaller than the radii of standard manufactured elbows.
10. Direct buried ducts shall be installed parallel to or at right angles to building lines and site features, and as close to curbs and sidewalks as possible to avoid interferences with future landscaping.
11. Where direct buried PVC ducts cannot be buried deep enough to meet the NEC minimum cover requirements, rigid steel conduits shall be installed instead, or a concrete cover shall be poured over the ducts.

12. An orange detectable marker tape (for communications) shall be buried in the backfill approximately 12 inches above duct banks or direct buried cables for the entire length of the duct run.
13. A flexible mandrel and a stiff bristled brush shall be pulled through the ducts to clean them prior to cable pulling.
14. Ducts shall be identified in the maintenance holes and at both ends.

C. Additional OSP Conduit Requirements

1. Leave all empty conduits with a 200-pound test nylon cord pull line.
2. Install a #14 AWG tracer wire in one conduit for the entire length of each duct run.
3. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.
4. Install conduit, including homeruns as indicated on the Drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a contract change. Deviations shall be made only where necessary to avoid interferences and when approved by Engineer by written authorization.
5. Where conduits must pass through structural members obtain approval of Architect.
6. Install all conduits or sleeves penetrating or routed within rated firewalls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.
7. Provide expansion and deflection coupling where conduit passes over a building expansion joint.
8. Service entrance conduits and feeder conduits in direct contact with earth shall be schedule 40, heavy wall PVC/HDPE. All service entrance conduit elbows shall be galvanized rigid steel. Service entrance conduits installed exposed or concealed in walls or above ceilings shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC). Service entrance conduits shall be installed "outside" of the building as defined by the N.E.C. Provide concrete encasement where required or as indicated on Drawings.
9. Seal all conduits entering building to prevent entrance of moisture.
10. Conduit fittings shall be gland and ring compression type for all conduit exposed to outdoor environments.
11. Below Grade Conduit Installations
    a. Install top of conduits 24 inches minimum below finished grade and as indicated on Drawings.
    b. Install top of conduits 6 inches minimum below bottom of building slabs.
    c. Where transition is made from below grade PVC installation to a metallic conduit system above grade or slab.
12. Communications cables shall not occupy conduits with power cables.
13. All metallic conduits shall be grounded in accordance with J-STD-607-A.
14. For runs that total more than 400 feet in length, insert handholes/maintenance holes so that no segment exceeds the 400 feet limit.
15. Conduit runs shall not have more than two (2) 90-degree bends between pull points.
16. Communication conduit system shall contain no condulets (also known as an LB).

3.02 MAINTENANCE HOLES/HANDHOLES

A. Maintenance holes/handholes shall be installed on a base of pea gravel at least 12 inches deep.

B. Tops of maintenance holes/handholes shall be level with the existing grade.

C. Ducts should enter as perpendicular to the wall surface as possible.

D. Maintenance holes shall be grounded with four 3/4 inch diameter by 8 foot long ground rods, one driven inside of the maintenance hole at each corner. Connect the ground rods and any duct bank ground conductors together with a No. 4/0 AWG bare, stranded copper ground wire loop. A No. 2 AWG bare stranded copper pigtail from the ground wire loop shall be used to ground the maintenance hole cover frame, ladder support bracket, any metallic concrete inserts and metallic cable racks, and the shields of any cables that are spliced in the maintenance hole.

3.03 CONDUIT PLUGS/CAPS

A. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until ready for use.

B. Simplex, triplex or quadplex duct plugs shall be installed in conduits to house and seal cables.

C. TDUX inflatable bladders shall be used to seal conduits equipped with MaxCell.

3.04 IDENTIFICATION

A. Refer to Section 27 05 53 - Identification for Communications Systems for labeling details.

END OF SECTION 27 05 43

SECTION 27 08 00 - COMMISSIONING OF COMMUNICATIONS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 - Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the equipment and execution requirements relating to Commissioning of Communications.

C. Equipment specifications, general considerations, and guidelines are provided in this document. The successful vendor shall meet or exceed all requirements described in this document and on the drawings.

1.02 WORK INCLUDED

A. The work included under this specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete installation. The Contractor will provide and install all of the required material whether specifically addressed in the Specification or not.

B. The work shall include, but not be limited to the following:

1. Provide all documentation, as-builts, training and warranty.

PART 2 - TESTING

2.01 TESTING REQUIREMENTS

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1. All conductors/strands of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors/strands in all cables installed.

B. Test Results

1. Test documentation shall be provided on disk as part of the as-built package. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation," the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair (or strand) and cable (or outlet) I.D., measurement direction, reference setup,

and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

2. The field test equipment shall meet the requirements of ANSI/TIA-568-C.2 and/or ANSI/TIA-568-C.3.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the Contractor may furnish this information in electronic form (CD). These CDs shall contain the electronic equivalent of the test results as defined by the Specification and be of a format readable from Microsoft Word.
4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

PART 3 - DOCUMENTATION, AS-BUILTS, TRAINING AND RECORDS

3.01 DOCUMENTATION & AS-BUILTS

A. As-Built record documentation for communications work shall include:

1. Cable routing and identification
2. System function diagrams
3. Manufacturers' description literature for equipment
4. Connection and programming schedules as appropriate
5. Equipment material list including quantities
6. Spare parts list with quantities
7. Details not on original Contract Documents
8. Test results
9. Warranties
10. Release of liens

B. The Contractor shall provide and maintain at the site a set of prints on which shall be accurately shown the actual installation of all work under this section, indicating any variation from contract drawings, including changes in pathways, sizes, locations and dimensions. All changes shall be clearly and completely indicated as the work progresses.

C. Progress prints shall be available for inspection by the Owner or any of his representatives and may be used to determine the progress of communications infrastructure work.

D. At the completion of the work, prepare a new set of as-built drawings, of the work as actually noted on the marked-up prints, including the dimensioned location of all pathways.

E. Furnish as-built drawings and documentation to the Project Manager. As-built drawings shall be generated in AutoCAD 2006 or later. Submit as-built drawings electronically on CD and hard copy.

3.02 OPERATIONS AND MAINTENANCE MANUAL

A. After completion of the work, the Contractor shall furnish and deliver to the Engineer three (3) copies of a complete Operations & Maintenance Manual. A system wiring diagram shall be furnished for each separate system.

B. The manual shall be subdivided into separate sections with tab dividers to identify subsystems of the integrated system. Reference appropriate Specification sections.

C. Provide the following additional information for each electronic system. Information shall be edited for this project where applicable.

1. Operations manuals for components and for systems as a whole
2. Maintenance manuals for components and for system as a whole
3. Point-to-point diagrams, cabling diagrams, construction details and cabling labeling details
4. List of spare parts, materials and suppliers of components. Provide name, address and telephone number for each supplier.
5. Emergency instructions for operational and maintenance requirements
6. Delivery time frame for replacement of component parts from suppliers
7. Recommended inspection schedule and procedures for components and for system as a whole
8. List of spare parts, materials and suppliers of components. Provide name, address and telephone number for each supplier.
9. Complete "reviewed" shop drawings and product data for components and system as a whole
10. Troubleshooting procedures for each system and for each major system component

3.03 TRAINING

A. The Contractor shall be responsible for training of facility personnel. Training shall take place after occupancy and before acceptance and shall include programs for on-site operations and maintenance of technology and communications systems. Training shall be for not more than ten (10) people, shall be held at the Owner's site and shall be of sufficient duration and depth to ensure that the trained personnel can operate the installed systems and can perform usual and customary maintenance actions.

3.04 WARRANTY

A. General

1. All equipment is to be new and warranted free of faulty workmanship and damage.
2. Replacement of defective equipment and materials and repair of faulty workmanship within 24 hours of notification, except emergency conditions

(system failures), which must be placed back in service within eight (8) hours of notification, all at no cost to the Owner.

3. The minimum warranty provisions specified shall not diminish the terms of individual equipment manufacturer's warranties.

B. Voice & Data Structured Cabling

1. Manufacturer(s) shall provide a minimum 15-year warranty for components used in the installed Voice & Data Structured Cabling System. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.

C. Coaxial Cabling Infrastructure

1. Manufacturer(s) shall provide a minimum 1-year warranty for components used in the installed Coaxial Cabling Infrastructure. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.

D. Pathway & Support Infrastructure

1. Manufacturer(s) shall provide a minimum 1-year warranty for components used in the installed Pathway & Support Infrastructure. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.

END OF SECTION 27 08 00

SECTION 27 70 10 - SURGE PROTECTIVE DEVICES

PART 1 – GENERAL

1.01 SUMMARY

A. These specifications describe the electrical and mechanical requirements for a hybrid, high energy, suppression filter system that integrates Surge Protective Devices (SPDs) with high frequency electrical line noise filtering for high exposure applications.

B. The specified unit(s) shall provide effective high energy transient voltage suppression, surge current diversion, and noise attenuation for all electrical modes of equipment connected downstream from a facility's meter or main over current device in high exposure ANSI/IEEE C62.41category C, B or A environments.

C. The unit shall be designed and manufactured by a qualified manufacturer of surge suppression equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacture of such products for a minimum of ten (10) years. These specifications are based on DITEK Surge Protective Devices (SPDs). For consideration, other manufacturers shall provide detailed compliance or exception statements to all provisions of this specification fifteen (15) days prior to bid.

1.02 STANDARDS

A. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

1. ANSI/IEEE C62.33 Standard Test Specifications for Varistor Protection Devices
2. ANSI/IEEE C62.35 Standard Test Specifications for Avalanche Semiconductor Protection Devices
3. ANSI/IEEE C62.41.1 IEEE Guide on the Surge Environment in Low-Voltage (1000V and Less) AC Power Circuits
4. ANSI/IEEE C62.42.2 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
5. ANSI/IEEE C62.45 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
6. UL -1283 Standard for Safety - Electromagnetic Interference Filters
7. UL -1449, Standard for Safety - Surge Protective Devices
8. NFPA 70 National Electrical Code
9. NFPA 75 Standard for the Protection of Electronic Computer Systems
10. NFPA 780 Standard for the Installation of Lightning Protection Systems
11. Military Standard (Mil Std) 220A Federal Information Processing Standards Publication 94 (FIPS PUB 94)CCITT
12. National Electrical Manufacturers Association;(NEMA LS1-1992 Guidelines) Low Voltage Surge Protective Devices

1.03 ENVIRONMENTAL REQUIREMENTS

A. Storage Temperature

1. Storage temperature range shall be -40° to +85° C (-40° to +185° F).
2. Internally mounted devices may be 0° to 40° C (32° to +104° F).

B. Operating Temperature

1. Operating temperature range shall be -40° to +60° C (-40° to +140° F).
2. Internally mounted devices may be 0° to 40° C (32° to +104° F).

C. Relative Humidity

1. Unit shall be operable within 0% to 95% non-condensing relative humidity.

D. Operating Altitude

1. The unit shall be capable of operation in altitudes up to 12,000 feet (3,658 meters) above sea level.

E. Audible Noise

1. The unit shall not generate any audible noise.

F. Magnetic Fields

1. No appreciable magnetic fields shall be generated. Unit shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

1.04 SYSTEM DESCRIPTION

A. Surge Protective Devices (SPDs) are the equipment required for the suppression, within specified limits, of AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients. Individual suppressors shall be installed as indicated on drawings.

1.05 OPERATING VOLTAGE

A. The nominal operating voltage and configuration shall be as indicated on the drawings.

1.06 SUBMITTALS

A. Submit in accordance with Section 16XXX, Basic Electrical Requirements.

B. Submit installation details for all suppressors demonstrating mechanical and electrical connections to equipment being protected.

C. Submittals shall include, but are not limited to, the following data:

1. Complete data for each suppressor type indicating conductor sizes, circuit type, operating voltage, and all appropriate dimensions.
2. Dimensions for each suppressor type indicating mounting dimensions and required accessory hardware.
3. Drawings shall be provided indicating suppressor mounting, lead configuration and mounting of remote diagnostic equipment and assemblies (where applicable).
4. List and detail all protection systems such as fuses, disconnecting and protective materials.
5. Listing to UL 1449, including voltage protection rating, nominal discharge current and short circuit current rating for each SPD specified.
6. Conformance to appropriate referenced standards and publications listed in section 1.02.
7. The submittal shall include a listed comparison and proof of compliance with each paragraph of these specifications.

D. Submitted suppressors shall have specifications equal to or better than the characteristics specified herein.

1.07 QUALITY ASSURANCE

A. Surge suppression, along with proper grounding and bonding, shall effectively protect within tested limits. This is protection against lightning transients, internal and external switching transients, and other surge transients throughout the useful life of the system.

B. Any SPD which shows evidence of defects in materials or workmanship during the warranty period shall be replaced or repaired at the Manufacturer's discretion.

C. Installation of an SPD in or on electrical or electronic systems shall in no way compromise or violate equipment listing, function or warranty of the distribution equipment.

D. All SPDs shall be guaranteed by the installing contractor to be free of defects in material and workmanship for a period of ten (10) years from the date of manufacture.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in surge suppression equipment of the type herein specified with a minimum of ten (10) years documented experience.

B. Installer: Installation shall be by a duly licensed and trained electrical contractor.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate work with electrical installations.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The intent of this specification is to allow manufacturers with similar equipment utilizing metal oxide varistor (MOV) technology to provide transient voltage surge suppression within the guidelines set forth herein.

B. The SPD manufacturer shall offer factory service and replacement for all units, within warranty guidelines. The manufacturer shall provide this service within a reasonable time frame.

C. Single source of supply. All AC power SPD's shall be manufactured by a single manufacturer.

1. Acceptable manufacturer:
   a. DITEK Corp
2. The following products are recommended for main distribution panel applications:
   a. D200 Series
3. The following products are recommended for distribution or sub-panels:
   a. D200 Series
   b. D100 Series
   c. D50 Series
4. All electronics, voice/data, video surveillance, access control, or fire system suppressors shall be manufactured by a single manufacturer. Acceptable manufacturer: DITEK Corp., models as further identified herein for each individual system specification. Manufacturers listed herein have demonstrated that they can provide equipment that meets or exceeds all requirements, however other manufacturers demonstrating compliance of specifications contained herein will also be considered.

2.02 COMPONENTS

A. Main service and distribution equipment suppressors: AC voltage SPDs shall be high speed, high current devices designed to protect electrical systems and electronic equipment from transient over-voltage events. SPDs shall provide continuous protection, and automatically reset. The SPD shall utilize Thermally Protected Metal Oxide Varistor TP-MOV™ technology. The SPD shall be installed in parallel with the service main disconnect, distribution or branch panel main lugs as applicable. SPDs shall be connected to overcurrent protection sized as indicated in installation instructions, with an AIC rating equal to or greater than panel rating. The suppressor shall have status indicator light(s). Dry contacts with remote alarm capabilities, audible alarm, and a surge counter are optional equipment.

1. Electrical Service
   a. Voltage shall be as indicated on drawings.
   b. Frequency -- 50/60 Hz
   c. Phases -- shall be as indicated on drawings.
   d. Wiring configuration – shall be as indicated on drawings

2. IEEE 62.41 Location Categories unless otherwise indicated on drawings:

Location Category		Low	Medium	High
Service Entrance/Outbuilding/Meter	C	C1	C2	C3
Sub-Panel/ Distribution Panel	B	B1	B2	B3
Outlets/Long Branch Circuits	A	A1	A2	A3

3. Electrical Performance
   a. Response time < 50 nanoseconds
   b. MCOV 125% minimum.
4. Minimum Surge Current:
   a. Service Entrance 00,000 Amps/Phase Minimum
   b. Distribution and Sub-panels 50,000 Amps/Phase Minimum
5. Suppression system protected modes shall be L-N, L-G, N-G, and L-L for Wye Systems L-L, and L-G for Delta systems. Ungrounded Delta Systems shall be L-L.
6. Power on indicators and failure detection: Light Emitting Diodes (LEDs) on the cover shall provide indication that the suppressor is properly activated and shall also indicate mode failure. If the suppressor fails, an isolated contact shall close. In addition, an audible alarm may be provided with manual reset, for those so equipped.

B. Enclosures: Enclosures for main service suppressors shall be, at a minimum, NEMA 3R/12.

C. Operation Status Indicator: Audible Remote Signaling and Visual Systems

1. Visual System
   a. Protection: Suppressor Functioning Normally – Green LED(s) on.
   b. Warning/Fault: Suppressor Failure – Green LED(s) off.
   c. Other visual indicators where approved.
2. Remote Signaling
   a. For units that are so equipped, relay with Auxiliary for Form C (dry) relay contacts: Two sets @ 1 Ampere, 120 volts each. 1 set N.O. and 1 set N.C. to operate upon failure of suppression module, blown fuse or tripped circuit breaker in suppressor module, AC power loss, or in disconnect switch for alarm connection to remote location.
3. Audible
   a. For units that are so equipped, the audible alarm shall activate upon a fault condition within the suppressor. An alarm silence/reset switch and push-to test switch shall be provided.

D. Communication Lines:

1. The following standard for separately mounted telephone and signal line suppressors shall apply. All protectors shall be securely mounted at protected equipment location. All suppressors shall provide common (L-G) mode protection on all lines. Suppressors shall be tested in accordance with IEEE C62.36 as a minimum. Protective interfacing with the telephone wire pairs shall be listed to UL 497A.

E. Network Data Protection:

1. Solid state, silicon avalanche diode components shall be the main protection technology utilized. Interfaces shall be RJ45, or 110 punch block connectors. The SPDs shall have a verified data transmission rate, without attenuation, of CAT5E speed minimum. The maximum clamp voltage of the SPD shall be no greater than 18 Volts on a 5 Volt circuit.

F. Power Over Ethernet (PoE) / Voice over Internet Protocol (VoIP) Protection:

1. Solid state, silicon avalanche diode components shall be the main protection technology utilized. RJ45 modular jacks shall be the connection method used. Connector pinouts shall conform to IEEE 802.3af for power distribution pairs and data transmission pairs. The maximum clamp voltage of the SPD on the power transmission pairs shall be no higher than 72 Volts. The maximum clamp voltage of the data transmission pairs shall be no higher than 72 Volts. The SPD shall have a verified data transmission rate, without attenuation, of CAT5E speed minimum.

G. Data Line Protection:

1. Solid state, silicon avalanche diode circuitry for protection from over voltages on long cable runs employing standard RS-232, RS422, or RS485. Appropriate connectors shall be utilized to interface a remote station with a host CPU.

H. Signal Line Protection:

1. Solid state, silicon avalanche diode, metal oxide varistor, and/or gas discharge tube technologies may be used. Hybrid circuitry for protection from over voltages on 2 or 4 wire signal lines such as balanced pair telephone, metallic pair telephone, buried and overhead field cable, remote radio equipment, and control systems. Unit shall be listed UL497B.

I. Modular, Twisted Pair Protection:

1. Solid state, silicon avalanche diode or metal oxide varistor circuitry for protection from over voltages on twisted pair data or audio lines. Protectors shall clip mount on 66 punch down blocks furnished with grounding bar or studs and shall be totally enclosed. Units shall be securely mounted at terminal locations where shown and shall be grounded to the main building ground with a minimum No.12 stranded copper green insulated ground conductor kept as short as possible. Ground terminals shall be screw insertion lug type. No crimp, fork or ring type permitted.

J. Coaxial Cable Protectors:

1. Solid state, silicon avalanche diode, metal oxide varistor and/or gas tube circuitry for non-interrupting over voltage protection of coaxial cable. Unit shall be provided with one female input connector and one female output connector.

Securely mount adjacent to protection equipment and ground to equipment or local building ground.

2.03 SYSTEM EQUIPMENT SPECIFICATIONS

A. Telephone and Intercom Systems

1. Suppressors shall be installed on the AC power at the point of service and shall meet the following criteria:
   a. UL 1449 Listed
   b. UL 1449 V.P.R. of 500 Volts or lower
   c. Diagnostic Indicator Light(s)
   d. Integrated ground terminating post (where case/chassis ground exists)
   e. Minimum Surge Current Capacity of 36,000 Amps (8 x 20 µSec)
   f. Ten Year Limited Warranty
   g. Acceptable Manufacturer:
      1) DITEK CORP. (800-753-2345) – DTK- 3GTP, or approved equal.
2. Suppressors shall be installed on incoming central office lines and shall meet the following criteria:
   a. UL 497A Listed
   b. Multi Stage protection design
   c. Auto-reset current protection with current limiting not to exceed 150mA per line
   d. Minimum Surge Current of 1,000 Amps per pair (8 x 20 µSec) 5.Ten Year Limited Warranty
   e. Acceptable Manufacturer:
      1) DITEK CORP. (800-753-2345) – DTK-SL Series or approved equal.
3. Suppressors shall be installed on all telephone/intercom circuits that enter or leave separate buildings and shall meet the following criteria:
   a. UL 497A Listed (where applicable)
   b. UL 497B Listed (speakers or communication circuits)
   c. Multi Stage protection design
   d. Auto-reset over-current protection with current limiting not to exceed 150mA per line -UL 497A units
   e. Over-current protection not to exceed 5 Amps per pair-UL497B units
   f. Minimum Surge Current of 1000 Amps per pair (8 x 20 µSec)
   g. Ten Year Limited Warranty
   h. Acceptable Manufacturer:
      1) DITEK CORP. (800-753-2345)
         a) DTK-SL Series
         b) DTK-2MHLP/2MHTP Series
         c) DTK-LVLP Series, or approved equal.

B. Fire Alarm Systems – Engineering Documentation – Fire Alarm Surge Specification

1. Line Voltage Surge Protective Devices
   a. Line voltage surge protective devices (SPDs) shall be provided to suppress all voltage transients which might damage fire alarm panel

components. The surge protection device shall wire in series to the power supply of the protected equipment. Line voltage surge protection device shall be installed directly adjacent to FACP.

2. Nominal 120 Volt Surge Protective Device
   a. SPDs for nominal 120 volt supply voltage shall be UL 1449 Third Edition listed or recognized with a minimum peak surge current of 54,000 amps. The SPD shall also meet IEEE C62.41 category B tests for surge capacity. The SPD shall feature multi- stage construction and be provided with dry contacts for monitoring and a long life indicator lamp for unit status of protected components.
3. Nominal 24 Volt Surge Protective Device
   a. SPDs for nominal 24 volt circuits shall be UL 497B listed and with a minimum surge rating of 20,000 amps. The SPD shall feature multi-stage construction and be self- resetting. Surge protective device shall be a base & plug style. The base assembly shall have screw terminals for fire alarm circuits. Base assembly shall accept a replaceable "plug in" surge protection module.
4. Alarm Dialer / Networking Surge Protective Device
   a. SPDs for alarm telephone dialer circuits shall be UL 497A listed. The SPD shall feature multi-stage construction and be self-resetting. Surge protective device shall be RJ connections or base & plug style. The base assembly shall have screw terminals for fire alarm dialer circuits. Base assembly shall accept a replaceable "plug in" surge protection module.
5. Acceptable Manufacturers
   a. All Surge Protective Devices (SPDs) shall be the standard product of a single manufacturer and be equal or better than one of the following:
      1) For 120 Volt nominal line voltage, DITEK DTK-120SRD series-connected, Dry Contact for remote notification of sacrifice ,20A AC power SPD;
      2) For 24 Volt nominal voltage, DITEK DTK-2MHLP24BWB series-connected, modular, 5A maximum current SPD.
      3) For alarm telephone dialers, DITEK DTK-2MHTPWB series-connected, modular SPD or RJ31X style, DITEK DTK-MRJ31XSCPWP
      4) For Ethernet networked systems DITEK DTK-MRJ45C5E, modular RJ45 style SPD.
      5) For Wireless GSM, DITEK DTK-VSPN
      6) For an all-inclusive surge solution using the above components, DTK-TSS1, DTK-TSS2, DTK-TSS3 and DTK-TSS4D.
      7) Acceptable Manufacturer: DITEK CORP. (800-753-2345)

C. Energy Management and Control Systems (EMCS)

1. Suppressors shall be installed on the incoming AC EMCS Panel and shall meet the following criteria:
   a. Parallel connected
   b. Suppression between L-N, L-G, N-G and L-L
   c. Surge Current Capacity: 32,500 Amps (8 x 20 µSec)
   d. Ten Year Limited Warranty
   e. Acceptable Manufacturer: DITEK CORP. (800-753-2345)

1) DTK-120/240HW, or approved equal.

D. Suppressors shall be installed on all EMCS LV circuits on points of entry and exit from separate buildings. Suppressors shall meet the following criteria:

1. UL 497B Listed
2. Multi-stage protection design.
3. Fail-short/fail-safe mode.
4. Minimum Surge Capacity: 2,000 Amps per pair (8x20 µSec)
5. System Voltage: 12 Vrms or 24Vrms
6. Ten Year Limited Warranty
7. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK-2MHLP Series
   b. DTK-TSS3
   c. DTK-LVLP Series, or approved equal.

E. Security Systems (Intrusion Detection)

1. Suppressors shall be installed on AC at the point of service and shall meet the following criteria:
   a. UL 1449 Listed
   b. UL 1449 V.P.R. of 500 Volts or lower
   c. Status Indicator Light(s)
   d. Center screw for terminating Class II transformers
   e. Minimum Surge Current Capacity of 32,000 Amps (8 x 20 µSec)
   f. Ten Year Limited Warranty
   g. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
      1) DTK-1F or approved equal.

F. Suppressors shall be installed on all Telephone Communication Interface circuits and shall meet the following criteria:

1. UL 497A Listed
2. Multi Stage protection design
3. Surge Current Capacity: 9,000 Amps(8x20 µSec)
4. Clamp Voltage: 180VDC, +/- 10%
5. Auto reset current protection with current limiting not to exceed 150mA
6. Ten Year Limited Warranty
7. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK- MRJ31XSCPWP, or approved equal.

G. Suppressors shall be installed on all burglar alarm initiating circuits, and signaling circuits which enter or leave separate buildings. The following criteria shall be met:

1. UL 497B for data communications or annunciation (powered loops)
2. Fail-short/fail-safe mode.
3. Surge Current Capacity: 20,000 Amp (8x20 µSec)
4. Ten Year Limited Warranty
5. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK-2MHLP_ _B Series and DTK-MB10 base

2.04 COMPUTER / DATA SYSTEMS

A. Suppressors shall be installed on AC power at the point of service and shall meet the following criteria:

1. UL 1449 Listed
2. UL 1449 V.P.R. of 400 Volts or lower
3. Status Indicator LED(s)
4. 12 Amp circuit breaker (rack mount) or 15 Amp circuit breaker (wall or desktop)
5. Minimum Surge Current Capacity of 36,000 Amps (8 x 20 µSec)
6. Minimum of 6 foot cord
7. Ten Year Limited Warranty
8. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
    a. DTK-8FF
    b. DTK-RMAC12, or approved equal.

B. Suppressors shall be installed on all computer/data circuits on points of entry and exit from separate buildings and shall meet the following criteria:

1. All pins must be protected
2. Must be Category 5e minimum, Gigabit Ethernet
3. Connection method: RJ45 (8-pin) or 110 Block.
4. Surge Current Capacity: Minimum 30 Amps per pair (8x20 µSec)
5. Ten Year Limited Warranty
6. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
    a. DTK-MRJ45C5E (single device)
    b. DTK-MRJPOE (single device)
    c. DTK-RM12C5RJ (12-port, RJ45, 1U rack mount, or approved equal)
    d. DTK-RM12POE (12-port, RJ45, 1U rack mount, or approved equal)

2.05 VIDEO SURVEILLANCE

A. Protectors shall be installed on coaxial cable systems on points of entry and exit from separate buildings. Suppressors shall be installed at each exterior camera location and shall include protection for 12 and/or 24 volt power, data signal and motor controls (for Pan, Tilt and Zoom systems). SPDs shall protect all modes herein mentioned and shall contain all modes in a single unit system. Protection for all systems mentioned above shall be incorporated at the head end equipment. Additionally a minimum 600VA battery back up shall be used to protect the DVR or VCR and monitor. Protectors shall meet the following criteria:

1. Head-End Power
    a. Battery Back Up
    b. Minimum Surge Current Capacity: 65,000 Amps (8x20µsec)
    c. Minimum of 2 NEMA 5-15R Receptacles (1 AC power only, 1 with UPS)
    d. All modes protected (L-N, L-G, N-G)
    e. EMI/RFI Filtering
    f. Maximum Continuous Current: 12 Amps
    g. Ten Year Limited Warranty

h. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   1) DTK-DRP16
   2) DTK-BU600PLUS, or approved equal.

2. Camera Power
   a. Minimum Surge Current Capacity: 2,000 Amps (8X20µsec); 30 Amps per pair for IP Video/PoE cameras
   b. Screw Terminal Connection
   c. All protection modes L-G (all Lines)
   d. Ten Year Limited Warranty
   e. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
      1) DTK-DP4P Series (PTZ Cameras)
      2) DTK-PVP Series (Fixed Cameras)
      3) DTK-RM12POE (12 port, 1U rack mount Power over Ethernet)
      4) DTK-MRJPOE (Single camera Power Over Ethernet), or approved equal.

3. Video and Data
   a. Minimum Surge Current Capacity 114 Amps per pair-Analog; 30 Amps per pair-IP Video/PoE Cameras
   b. "BNC" Connection (Coax); RJ45 IP Video/PoE Cameras
   c. Protection modes: L-G (Data), Center Pin-G, Shield-G (Coax)
   d. Minimum Band Pass 0-10MHz
   e. Ten Year Limited Warranty
   f. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
      1) DTK-DRP16 (Head End)
      2) DTK-RM16NM (16 channel, 1U rack mount)
      3) DTK-DP4P Series (PTZ Camera)
      4) DTK-PVP Series (Fixed Camera)
      5) DTK-iBNC28 (Coax video only)
      6) DTK-PVPIP (Single camera video, data and power)
      7) DTK-RM12C5RJ (12 port, 1U rack mount mount)
      8) DTK-RM12POE (12 port, 1U rack mount Power over Ethernet)
      9) DTK-MRJPOE (Single camera Power Over Ethernet), or approved Equal

2.06 CABLE TELEVISION SYSTEMS

A. Suppressors shall be installed at the point of AC service to the head end equipment and meet the following criteria:

1. Minimum Surge Current Capacity: 27,000 Amps (8 x 20 µSec)
2. All mode protection: L-N, L-G, N-G
3. EMI/RFI Filtering
4. UL 1449 Listed
5. UL V.P.R. of 500 Volts or less
6. Diagnostic Indicator Light(s)
7. Ten Year Limited Warranty
8. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK-1F

b. DTK-8FF, or approved equal

B. Suppressors shall be installed on all coaxial cable systems on points of entry and exit from separate buildings. Suppressors shall be installed at each exterior camera location and shall meet the following criteria:

1. Impedance: Match the existing system being protected (75 Ohm).
2. Band pass: 0 - 2GHz
3. Surge Current Capacity: At least 20 kA (8 x 20 µSec waveform)
4. Clamping Voltage: 75VDC Center Pin to shield
5. Response Time: Less than one nanosecond.
6. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK-VSPA
   b. DTK-VSPA2 or approved equal.

2.07 ACCESS CONTROL SYSTEMS

A. Suppressors shall be installed on AC power at the point of service and shall meet the following criteria:

1. UL1449 3rd Edition Listed
2. UL1449 V.P.R. of 500 Volts or lower
3. Status Indicator Light(s)
4. Minimum Surge Current Capacity: 144,000 Amps (8 x 20 µsec)
5. Maximum Continuous Current: 15 Amps
6. MCOV: 125VAC
7. Service Voltage: 110-120 VAC
8. Ten Year Limited Warranty
9. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
   a. DTK-8FF or approved equal.

B. Suppressors shall be installed on the Burg/Fire Low Voltage circuit at both the point of entrance and exit of the building. Suppressors shall meet the following criteria:

1. UL 497B
2. Minimum Surge Current Capacity: 2,000 Amps per pair
3. Maximum Continuous Current: 5 Amps
4. MCOV: 33 Volts
5. Service Voltage: 24Volts
6. Ten Year Limited Warranty
7. Acceptable Manufacturer – DITEK CORP. (800-753-2345)
   a. DTK-2MHLP24BWB
   b. DTK-1LVLPLV or approved equal.

C. Suppressors shall be installed on the communication circuit between the access controller and card reader at both the entrance and exit of the building. Suppressors shall meet the following criteria:

1. Conforms with UL497B standard (where applicable)
2. Clamp level for 12 and 24V power: 18VDC / 38VDC

3. Clamp level for Data/LED: 6.8VDC
4. Service Voltage for Power: 12VDC/24VDC
5. Service Voltage for Data/LED: <5VDC
6. Clamp level – PoE Access Power: 72V
7. Clamp level – PoE Access Data: 72V
8. Service Voltage – PoE Access: 48V-54V
9. Service Voltage – PoE Data: 5V-24V
10. Ten Year Limited Warranty
11. Acceptable Manufacturer – DITEK CORP. (800-753-2345)
    a. DTK-4LVLPCR (use DTK-3LVLP-X for "Wiegand" type readers)
    b. DTK-4LVTEP (commercial telephone entry)
    c. DTK-4LVXR (residential telephone entry)
    d. DTK-MRJPOE (Power over Ethernet access control), or approved equal.

2.08 ELECTRONIC EQUIPMENT

A. Suppressors shall be installed at the point of AC service to the electronic equipment and meet the following criteria:

1. UL1449 Listed
2. Must have 3 AC outlets capable of handling 15 Amps.
3. Minimum Surge Current Capacity: 36,000 Amps (8 x 20 µSec)
4. All mode protection: L-N, L-G, N-G
5. EMI/RFI Filtering
6. Diagnostic Indicator Light(s)
7. Ten Year Limited Warranty
8. Acceptable Manufacturer: DITEK CORP. (800-753-2345)
    a. DTK-3GTP or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Main Service and Distribution Equipment Surge Suppressors

1. Suppressors shall be installed at Service Entrance switchboards and distribution equipment where shown as close as practical to equipment to be protected consistent with the available space. Where installation space permits and where no code restrictions apply, suppressors may be installed within protected equipment. Suppressors installed in this manner shall utilize the equipment ground bus as a medium for bonding of their ground terminals. Bolted connections with star washers shall be used to insure electrical and mechanical integrity of connections to the ground bus. Conductors from suppressors shall attach to main service bus in the entrance equipment on the load side of any electrical metering equipment.
2. Suppressors shall be installed according to manufacturer instructions provided with each device. Lead dress shall be consistent with recommended industry practices for the system on which these devices are installed.

3. All wiring between surge suppressors and protected equipment shall be considered protected and connected in accordance with the latest edition of the NEC.
4. A minimum of three inches of separation shall be provided between parallel runs of protected and unprotected wiring in control panels, terminal cabinets, terminal boards and other locations. In no case shall protected and unprotected wiring be bundled together or routed through the same conduit.

B. Low Voltage and Comm/Data Equipment Surge Suppressors

1. Install SPD equipment according to manufacturer's recommendations.
2. All electronic equipment/systems utilizing cord, plug or hardwired connectors shall be bonded to the building electrical system ground, building frame or driven ground rod and shall be provided with a multi-stage suppression system.
3. Contractor must properly match SPD equipment to equipment being protected, including wire sizes, operating voltages, currents and number of conductors.
4. Contractor must coordinate with providers of all equipment being protected and provide SPD equipment which meets these specifications.
5. Suppressors shall be installed in a neat manner. All hardwired low-voltage circuit lead lengths (conductor/wire distance) shall be a minimum of 3 wire feet. Make certain that the referenced ground connections are of a lesser distance (conductor/wire length) than that of the suppressor to the protected equipment.
6. Equipment shall be installed following manufacturer's recommendations and guide- lines in compliance with NEC Article 280/250 for grounding and bonding; and NEC Article 110-9 and 110-10 for over-current protection.
7. Provide required enclosures (indoor or outdoor) for protectors adjacent to each electronic system. Supplier to provide cabinet large enough to include mounting protectors within system cabinet.

C. Quality Control

1. Disconnect suppressor prior to testing of service entrance distribution equipment and panel boards.
2. Supply certified test reports for all tested parts, elements and/or systems or where required by the Owner to substantiate published ratings of claims.

END OF SECTION 27 70 10

SECTION 28 05 06 - ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Provide Access Control equipment as specified herein and as shown on the schedules and drawings. Installing contractor shall receive, place, connect, and mount all equipment specified in this Section per the manufacturer's instructions. Installing contractor shall furnish all hardware, wire, connectors, and other necessary items as required for a complete and functional Access Control system.

B. Related Sections

1. 27 00 00 Communications

1.02 REFERENCES

A. The General Conditions, Supplementary Conditions, and Division 1 Specifications shall apply to all work of this section.

B. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

C. Underwriter's Laboratories (UL)

1. UL 508 Industrial Control Equipment
2. NEC National Electrical Code (latest edition)

1.03 WORK INCLUDED

A. The Electronic Security Contractor shall furnish labor, equipment, and materials for the Access Control system including but not limited to:

1. Wiring.
2. Equipment cabinets.
3. Data gathering panels, readers, system software, access control host computer, badging station and system software & programming.

B. This Section consists of furnishing and installing a card access system as part of the Security Monitoring and Control System to include the following:

1. Keypads
2. Passive Infrared Exit Motion Sensors
3. Electric Strikes; coordinate exact locking hardware with door hardware consultant.

4. Door Contacts

1.04 APPROVALS

A. General

1. Submittals shall be made in accordance with the General Provisions of these specifications.

B. Specific Requirements

1. Submit catalog cuts for all equipment and devices being furnished under this Section.
2. Submit a complete Access Control System riser diagram. Diagram shall include labeling of each reader and its corresponding head end equipment connection point and interconnecting wiring of all components.
3. Submit floor plan drawings showing location and mounting of each card reader.

1.05 DESCRIPTION

A. The Access Control System shall provide a means to control and monitor access at specified doors throughout the facility.

B. Each system shall consist of keypad devices, status input devices, output control devices, control processor(s), interface modules, file server, remote terminals, printers, software and programming.

C. An enrollment terminal for programming the access system security functions shall be provided for the system. No other terminal shall be capable of entering or modifying the access system.

D. The software shall run on a Microsoft Windows (latest version) operating system.

E. The contractor shall provide the latest version of operating system at the end of the project. At closeout and at the end of the warrantee period, the latest version of software shall be loaded onto the operating system. In addition, a backup copy of the software shall be turned over to the Owner.

F. The software shall be user programmable. All source codes, passwords and any other codes shall be turned over to the Owner such that the Owner can have access to any and all parts of the software and any other components. The intent is for the Owner to have complete access to all components of the system he is purchasing without the need of a maintenance contract. Although an after warrantee maintenance contract may be considered by the Owner. See additional requirements herein and in the Security General specification sections.

G. The new system shall have a 5.25 TeraByte hard drive minimum.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acceptable Manufacturers

1. HID
2. Honeywell
3. DoorKing
4. Securitron
5. Altronix
6. Or Approved Equal

B. Scope

1. This specification outlines the requirements for a single local controller up to a centrally controlled distributed processing and centrally programmed monitored access control system capable of running on an industry standard computer with the manufacturer's priority software.

C. Computer Hardware Requirements

1. The computer shall be configured at a minimum in a following manner.
2. Furnish and commission a centrally located host computer and software as described following:
    a. IBM PC 100% compatible computer, Intel Core i7-3770 CPU at 3.4 MHz
    b. 64 GB of RAM
    c. 6 TB Hard Drive
    d. DVD +/- RW Optical Drive
    e. 25" LCD Color Display
    f. Printer port and line printer for event printing
    g. Two RS232 and one RS485 serial communication ports
    h. Microsoft compatible bus mouse
    i. Surge protector
    j. Uninterruptable Power Supply

D. Computer Software Requirements

1. The computer shall include the following software:
    a. Windows 7
    b. WINPAK Pro or approved equal.
    c. Approved equal

E. Computer Software Features

1. The following features shall be provided for the computer:
    a. Programming of users and system configuration information across multiple systems.
    b. Password protected, multilevel operator programming capabilities
    c. Issue of commands to any controller from the computer, like momentarily unlocking a door.
    d. Storage to hard disk of all event transactions.

e. Archive to floppy or tape of stored event transactions for long term storage.
f. User customizable reports generated from stored event transactions.
g. User, door and alarm input English text names appear on screen, printer and reports.
h. Host operator action logging to disk.
i. Customizable event and report print.
j. The system shall provide for a minimum of 1,000 users.
k. The system shall provide for a maximum of 10,000 users.

F. Host Computer to Controller Communication Protocols

1. Communications between the computer and the controller shall be accomplished utilizing a standard 10/100 TCIP connection.

G. Maximum System Wide Capacities

1. The following shall be the maximum system-wide capacities. Actual numbers shall be dependent upon mix of controllers that make up the system.
a. 32,640 readers
b. 261,120 monitor alarm inputs
c. 4032 control relay inputs
d. 2,040 controllers which can be any combination of access control; alarm monitoring and relay controllers

H. Head End Components

1. Controller
a. There shall be three primary types of controllers: access control, alarm monitoring and relay control.
b. The controller board shall be microprocessor-based incorporating ROM, on board battery backup RAM and a clock calendar. The ROM shall be modularly upgradeable in the field for enhancements to systems features. All power connections to the controller board shall be protected by fuses. All wiring connections to the controller board shall be screw terminals. Each door connection shall consist of terminals for two readers, one 5 amp rated form c dry output relay for lock control and one input for monitoring and status switch, a request to exit device and tamper switch. There shall be status indicator lights for active relays as well as diagnostic indicator lights to aid in system trouble shooting.
c. There shall be dedicated alarm output relays for external reporting of the following conditions: Alarm, Duress, Tamper, Trouble.
d. The controller enclosure shall be a NEMA style metal cabinet designed for surface mounting. It shall have a tamper proof removable hinge door with a high security lock.
e. The controller shall have an internal power supply that will accept 60 Hz 120V AC. The primary site of the power supply shall be protected with a fuse. The power supply shall provide 28V DC power to the controller board, internal battery charger, scrambling keypads (if applicable), selected card readers and reader interface boards.

f. Controller shall be Honeywell PRO-2200 Series or approved equal.

I. Standby Battery

1. The controller shall have an internal standby battery that is capable of running the system during AC power interruption which shall be automatically recharged by a charging circuit incorporated into the controller board. This standby battery shall be capable of operating the system for 4 hours minimum.

J. Expansion Options

1. A maximum of 5 expansion boards can be installed in each controller. An interface board is included with each controller.
2. Alarm Inputs:
   a. Each controller shall be capable of accepting up to 16 additional supervised alarm inputs in increments of 4 and/or 8. Alarm expansion boards shall be mounted in the controller cabinet and connect to the controller board by an expansion bus cable.
   b. Alarm Input units shall be Honeywell PRO22IN or approved equal.
3. Relay Outputs:
   a. The two access control and one alarm monitoring controller shall be capable of accepting up to 32 additional relay outputs in increments of 8. The outputs shall be used for control applications other than standard door access such as elevator floor control, local door annunciator, HVAC interface etc. The relay expansion boards shall be mounted in the control room cabinet and connect to the controller board via an expansion bus cable.
   b. Relay Output Units shall be Honeywell PRO22OUT or approved equal.
4. Code Database:
   a. The controller shall be capable of expanding the code database up to a minimum of 50,000 users with the addition of a memory expansion board. The board shall be mounted in the controller cabinet connected to the controller board via an expansion bus cable.
5. Event Transaction Buffer:
   a. The controller shall be capable of expanding the event transaction buffer up to a maximum 3500 alarms with in each board. The board shall be mounted in the controller cabinet and connected to the controller board via an expansion bus cable.
6. Serial Communication Interface:
   a. The controller shall be capable of interfacing to a serial printer for event transaction printing or to a serial terminal for programming with the addition of a serial interface board.

K. Power Supplies

1. Power supplies shall be:
   a. Securitron – BPS Series
   b. Altronix – AL 1012 Series
   c. Or Approved Equal
2. Each access controlled door shall be provided with a power supply, meeting the following minimum performance requirements:

a. Input: 115-120VAC
b. Output: 12VDC or 24VDC
c. Output Current: 1A
d. Battery Backup
e. UL Class 2 Listed

3. Multiple controlled doors, in close proximity to one another, may connect to the same Power Supply dependent upon available outputs and manufacturer's recommended electrical specifications.
4. 115-120VAC circuits to Power Supplies shall be by the Electrical Contractor.

L. PoE Switches

1. PoE Switches shall be:
   a. Honeywell – ProWatch Series
   b. Securitron – AQE Series
   c. Or Approved Equal
2. Switches shall be rack mountable, and meet the following minimum performance requirements:
   a. 16 output ports
   b. IEEE 802.3at compliant
   c. Remote PoE shutdown per port or all ports simultaneously
   d. 10/1001000 Base-T Gigabit support

M. Access Control Features

1. The controller shall have the following access control features at a minimum:
   a. Restrict access by time of day, day of week, door or holiday.
   b. Momentary unlock of door.
   c. Relock of door by code, card or time zone.
   d. Door status monitoring shall allow for door forced monitoring, door open too long monitoring, door opened too long while door is unlocked, auto relock of door when open or closed.
   e. Request exit alarms and/or unlocks.
   f. Two person requirement per door.
   g. Passback control including use restriction based on status.
   h. Absentee rule limits.
   i. Temporary day limits.
   j. Occupancy counting minimum/maximum limits.
   k. Coordinate with the Owner for any other operating features required.

N. Hot Redundant CPU & Software

1. Provide a complete redundant CPU equipped with all software and hardware necessary, hot and on line, ready to take over in case of failure of the primary CPU operating system.
2. Provide a second workstation with complete operating software. Coordinate location with the Owner.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data; including product technical bulletins, product catalog, installation instructions, submittal sketches or drawings, and product carton instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify that related conditions, including equipment that has been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. All devices connected to equipment specified in this section shall bear the UL, cUL, or CSA label and comply with all applicable National Electrical Code (NEC) standards.

3.03 PREPARATION

A. The electronic security contractor shall develop custom software as required to affect the functions of the system as dictated by the drawings and Specifications.

B. The electronic security contractor shall provide equipment cabinets for installation of the control equipment and cable terminations to the equipment.

C. All equipment related to the system shall be factory tested before shipment.

3.04 INSTALLATION

A. Contractor shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein.

B. Install in accordance with manufacturer's handling and installation instructions.

C. Install in accordance with all local and pertaining codes and regulations.

D. All equipment and systems shall be installed by the ESC. Subcontracting of equipment installation shall not be permitted.

E. Equipment shall be ready to use condition at end of installation.

F. Energize equipment in accordance with manufacturer's instructions.

3.05 PROTECTION AND CLEANING

A. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

B. Touch up, repair, or replace damaged components before Substantial Completion.

C. Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of equipment. Remove construction debris from equipment area and dispose of debris.

D. Clean integral air filters, heatsinks, grills, and fans before Substantial Completion and Commissioning Services.

3.06 WARRANTY

A. The ESC shall provide a single source warranty for all supplied equipment specified in this section to be free of defects in material and workmanship for a period of two (2) years from the date of substantial completion.

END OF SECTION 28 05 06

SECTION 28 31 11 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers the complete installation of a new automatic fire alarm system, as well as necessary materials, labor, calibration, testing and training.

B. The complete installation shall be in compliance with NFPA 70, 72, 101 (Life Safety Code) and NEC Article 760. The installation shall also comply with state and local ordinances, as well as the Americans with Disabilities Act (Public Law 101-336).

C. All equipment supplied shall be listed for the purpose and area in which it is used and installed in accordance with any instructions included in its listing.

D. All equipment must be new and bear the UL (Underwriters Laboratories Inc.) Label.

1.02 SHOP DRAWINGS

A. Fire alarm shop drawings shall contain the following:
1. Specification sheet/sheets of technical data on each hardware component
2. Specification sheet(s) on wiring to be utilized
3. One-line schematic riser diagram made specifically for this job
4. Calculation for sizing batteries and power supplies
5. Sequence of operation for the entire system
6. Copy of vendor's NICET fire alarm certificate (level III or higher)
7. Verification of central supervising station (UL Certified)
8. Equipment and service warranty
9. Scaled floor plans showing fire alarm device locations and wire routing

1.03 ACCEPTABLE MANUFACTURERS

A. Products of the following manufacturers which comply with these specifications are acceptable:
1. Notifier
2. Siemens
3. E.S.T.
4. Simplex
5. Gamewell-FCI

1.04 STORAGE AND HANDLING

A. Smoke detectors shall be covered with plastic wrapping if installed prior to the completion of painting, sanding and other work producing dust, etc.

B. The fire alarm control panel(s) shall not be installed until its designated room has been completely painted and cleaned.

PART 2 - PRODUCTS

2.01 CONTROL PANEL/SYSTEM DESCRIPTION

A. The fire alarm system shall be an electrically supervised, power limited, low voltage (24 VDC), non-coded, multiplexed, fully analog, addressable system. The fire alarm control panel shall be of modular design for ease of future system addition or modification (up to 20% addition capacity).

B. The control panel shall provide system status via an 80 character liquid crystal display and shall also have the following features:
   1. Power "ON" Light Emitting Diode (LED)
   2. System Reset Switch
   3. System Alarm LED
   4. System Trouble LED
   5. Alarm Silence Display
   6. Trouble Silence Display
   7. Control panel shall be lockable.
   8. Normally open and normally closed sets of contacts for control of remote equipment/devices.

C. Batteries shall be mounted in space provided in the fire alarm control panel. Control panel shall include automatic charging circuit to maintain battery/batteries in charged condition. Batteries may be lead acid or nicad; charging circuit shall match battery type.

D. The battery/batteries shall have sufficient ampere-hour capacity to operate the system under normal supervisory conditions with A.C. power disconnected for 24 hours, and at the end of that period to operate all alarm notification appliances for 5 minutes. For calculation purposes, all audible devices shall be tapped at a minimum of one (1) watt.

E. The system shall operate from one (1) 20-ampere, single-phase, 3-wire 120 V.A.C. circuit. The circuit breaker shall be labeled "Fire Alarm Circuit Control."

F. The fire alarm system shall respond to a fire emergency through the operation of the following systems:
   1. Smoke damper control and automatic shutdown of HVAC air systems shall occur upon activation of respective duct smoke detector.
   2. Automatic audible/visual notification (via horns/strobes) shall be provided upon activation of a flow switch, manual station, or area smoke detector.
   3. Signal output to the UL Listed central station (for fire system reporting) via a D.A.C.T. communication device (or similar UL Listed "fire" device) in FACP(s). Provide and install 3/4" conduit from the panel to the main telephone backboard.
   4. Smoke door release (where applicable) shall occur generally throughout the entire facility.
   5. Tamper switch operation shall cause a supervisory signal to indicate audibly and visually at the control panel.
   6. Notification at control panel upon activation of kitchen hood fire suppression system.
   7. The following conditions of emergency generator(s) shall be monitored by the fire alarm system:
      a. Generator running

b. Generator fault
c. Generator switch in non-automatic position

G. Supervision
1. Initiating Device Circuits (IDC) shall be Class B.
2. Signaling Line Circuits (SLC) shall be Class B.
3. Notification Appliance Circuits (NAC) shall be Class B.
a. Circuits shall be protected from the point at which they exit the control unit until they enter the evacuation signaling zone they serve. Circuits shall meet pathway survivability requirements Level 0 or 1.
4. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.
5. Power failures, opens, or grounds shall be audibly and visually indicated at the control panel and the remote annunciator (where applicable). A green "power on" LED shall be displayed continuously while incoming power is present.
6. Power wiring to sprinkler pipe heat tracing shall be supervised by fire alarm system.

2.02 FIELD DEVICES

A. Manual Stations: Semi-flush, addressable, double action type. Station shall be constructed of high impact red polycarbonate.

B. Area Smoke Detectors: Smoke detectors shall be of the analog, addressable, photoelectric type. A pulsed diode pilot lamp, visible from the floor, shall be provided to indicate alarm condition or component failure. Diode pilot lamp may be pulsed diode type for normal and steady for alarm trouble indication. Detectors shall be self-supervising for component failure as well as line failure. Detector failure or removal of detector shall initiate (zone) trouble signal. Detector shall be capable of monitoring 900 square feet of unobstructed area with spacing not to exceed 30 feet on center. Smoke detectors shall be ceiling mounted and shall be interconnected into alarm system to function in same manner as the manual station. Detectors shall report analog level of smoke/dirt to panel.

C. Duct Smoke Detectors: Detectors shall be of the analog, addressable, photoelectric type. The unit shall consist of a detector and an air sampling assembly housed in a casting designed for duct mounting. The sampling tubes shall extend completely across the duct. Detectors shall report analog level of smoke/dirt to panel. Where detector LEDs are concealed or not easily observable, detectors shall have remote LED alarm indicators in an observable location for alarm identification. Each LED shall be labeled to identify location of duct smoke detector.

D. Audible/Visual Devices: Audible/visual devices shall be horns with flashing visual appliances with the word "FIRE" written on the lens. The horns shall produce at least 15 dBa above ambient noise level. Audible and visual devices (including the combination device) shall utilize a 4" electrical backbox. Visual devices shall be multi-candela, field-selectable, with a constant flash rate of one (1) flash per second. The device color shall be white.

E. Any audible device installed in a sleeping room shall have a low-frequency sounder approved for fire protective service, and shall be listed to UL 464. The device shall be powered from a notification appliance circuit output and shall operate on nominal 12 or 24 volts (includes fire alarm panels with built in sync). All notification appliances shall be backward compatible.

F. Addressable relays shall be provided as required to accomplish all mechanical systems and other related control functions.

G. Addressable input monitoring devices shall be provided as required to monitor existing water flow, tamper switch, and other devices.

H. Heat detectors shall be addressable, fixed temperature type rated at 135 degrees F, unless noted otherwise on drawings

I. Single/Multiple Station Smoke Detectors with Integral Sounder: Detectors shall be addressable, system-connected with built-in evacuation horn and power-on indicator. Where more than one is installed in a living unit, activation of one detector shall trigger all horns in that unit.

J. Monitoring of remote fire protection valves on site (if applicable) shall be accomplished via fire alarm system connection.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall obtain approval from Owner as to the final and exact location of each control panel and remote annunciator prior to installation.

B. All wiring shall be suitably protected from damage. Wiring shall be routed within conduit where installed in the following areas:
   1. underground
   2. damp and wet locations
   3. where exposed on interior walls
   4. for all input and output signal wiring for smoke exhaust (including stairwell pressurization) equipment
   5. where concealed in a wall or inaccessible ceiling

C. All wiring installed exposed within a plenum shall be UL Listed accordingly. Plenum rated cable shall be tied to the building structure at approximately 6'-0" on center using cable ties.

D. Conduit sleeves with bushings shall be installed for fire alarm cabling that passes through walls and floor assemblies. Seal the opening around the conduit and the hole in the conduit with a UL Listed fire rated sealant as required.

E. Provide necessary programming to accomplish the indicated system operation and control functions.

F. All conduit, control wiring, power wiring, relays, and other equipment and devices required to form a complete and operational system shall be provided as part of this Contract.

G. All wiring requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the manufacturer.

3.02 WARRANTY

A. Equipment, materials, workmanship and system performance incorporated into the work shall be guaranteed for a period of one (1) year from the time the Owner receives beneficial use of the fire alarm system and the acceptance tests herein specified have been satisfactorily completed. Any defects due to faulty materials, methods or installation or workmanship within this period shall be promptly repaired or replaced.

B. Vendor shall provide pricing for system inspections for a period of four (4) additional years after the initial 12-month warranty as a bid alternate to the Owner. Provide inspections per N.F.P.A. 72 and N.F.P.A. 101.

C. Spare Parts: Provide the following spare equipment items to the Owner upon project completion:
   1. Addressable modules: 2
   2. Smoke detectors: 2
   3. Manual stations: 2
   4. Duct mounted smoke detectors: 1
   5. Audible/visual devices: 4

3.03 TESTING AND CERTIFICATION

A. Testing and certification of the life safety system per NFPA 72 2-2 shall be as required by the Fire Marshal and Engineer. The Contractor shall be responsible for identifying the required testing, coordinate scheduling, and conducting the test necessary to achieve occupancy certification, and assurance of complete system operation. The Contractor shall submit proof of complete system operation signed by the Fire Marshal to Engineer and Owner.

B. Contractor shall notify the Owner's representative in writing that the Owner is responsible for hiring a monitoring agency for remote supervision of the fire alarm system.

END OF SECTION 28 31 11

SECTION 31 10 00 - SITE CLEARING

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. Section Includes: Provide all operations required in connection with the general clearing of the site, including the following:
   1. Stripping of top soil
   2. Clearing and grubbing of site areas at all new paving
   3. Preservation of existing utilities
   4. Demolition of existing above and below grade improvements as required by the Work of the Contract
   5. Removal of all existing and generated trash and during clearing and grubbing
   6. Location and protection of bench marks

B. Related Sections include the following:
   1. Division 2 Section “Earthwork.”

1.03 COORDINATION

A. Coordinate clearing work with the work of other related trades so as not to delay progress of any section of the work.

B. Notify and coordinate with any and all utility companies or agencies as required for capping, removal, by-passing or protections of existing utility lines.

1.04 GENERAL REQUIREMENTS

A. Comply with all applicable federal, state and local codes and ordinances and with the requirements of insurance carriers providing coverage for this work.

B. Procure and pay for all permits or certificates required for the work involved.

1.05 EXAMINATION OF SITE

A. Contractor shall visit and examine the site to ascertain the actual nature and scope of any demolition work. Later claims for additional compensation covering difficulties encountered in demolition work will not be recognized.

PART 2 - PRODUCTS

2.01 STOCK PILING

A. Store topsoil, stripped from site improvement areas, in areas designated or approved by Architect for distribution or removal later. Handle topsoil carefully to prevent contamination with undesirable materials. Topsoil so stored shall be reasonably free from debris.

B. Topsoil shall be provided by the Contractor from on-site material which has been stockpiled for re-use. Off-site borrow should only be used when on-site sources are exhausted.

C. Salvageable materials, if any, resulting from clearing work shall become the property of the Contractor, unless identified to be retained by the Owner.

PART 3 - EXECUTION

3.01 PREPARATION

A. Consult Owner prior to removal of existing trees and shrubs. Tag all plant material identified to remain.

3.02 PROTECTION

A. Before and during site clearing operations, Contractor shall ascertain where existing utilities are located. Any damage that may occur to existing services shall be promptly corrected by the Contractor at no additional cost to the Owner.

B. Prior to beginning stripping and clearing, coordinate with Architect on methods and markings of areas not to be disturbed.

C. Erect necessary barricades, and protective measures as required.

D. Protect trees, plant growth, and features designated to remain as final landscaping. Barricades shall be placed around the drip line of trees indicated to remain that are within the construction area. Vehicle traffic shall not be allowed under any trees.

3.03 STRIPPING OF TOPSOIL

A. Scrape and remove all brush, weeds, grass, roots and other material from areas which are to be stripped of topsoil.

B. Strip to a depth of 6" from the areas within lines 5'-0" outside of foundation walls of buildings and from under all walk and paving areas.

C. Pile topsoil in designated locations, where it will not interfere with construction or utility operations, for use in planting areas. Remove excess and/or unacceptable top soil from the site.

3.04 CLEARING

A. Clear the area within the limits to remove all subterranean or surface material, growth or other obstructions.

B. Remove all stones, stumps, roots, old concrete masses or other similar items larger than 3/4" diameter, to a minimum depth of 24" below natural grade in landscape bed areas and 6" below proposed grades in areas to be covered by building or paving.

C. Remove trees and strumps from area of improvements as shown on drawings. Do not remove other trees without approval from the Owner. Use methods of removal which will prevent damage to remaining plant materials and property.

D. Fill any holes left by removal of large stones or stumps per requirements of applicable articles of Division 31 Section – “Earthwork”. Compact backfill to the density of surrounding soils.

E. Following each day of grubbing activity, grade surface to remove open holes and ruts and allow unrestrained runoff of storm water. Ponding will not be permitted.

3.05 DEMOLITION

A. Remove all obstructions located within or outside the property lines that would interfere with installation of new work such as paving, walks, curbs, slabs, walls and other items. No high impact vibrations permitted. Execute all clearing work by methods which will prevent damage to other work or adjoining properties and which will prevent settlement or erosion to adjoining areas.

B. Unless otherwise noted to remain, clear the site of all existing pavements, concrete walks, concrete steps, fences, structures and the like to a depth of 24" below proposed grades.

C. Refer to Topographic Survey Drawing for location of existing items and structures which are affected by demolition and clearing/grubbing requirements.

3.06 DISPOSAL

A. Except as otherwise provided, all items cleared from the site, including all asphalt, concrete, building materials, rubbish, brush, stumps, debris, etc., resulting from the work of this section shall be removed and disposed of off-site.

END OF SECTION 31 10 00

SECTION 31 22 00 - EARTHWORK

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. Section Includes:
   1. Earthwork materials
   2. Excavating and backfill
   3. Preparing subgrade
   4. Soil stabilization
   5. Testing requirements

B. Related Sections include the following:
   1. Division 00 Section “Soil Report.”
   2. Division 01 Section “Testing.”
   3. Division 07 Section “Vapor Barrier”.
   4. Division 31 Section “Clearing.”
   5. Division 31 Section “Soil Stablization.”
   6. Division 32 Section “Asphalt Concrete Paving.”
   7. Division 32 Section “Concrete Paving.”
   8. Division 33 Section “Utilities.”

1.03 SCOPE

A. Provide required earthwork relating to building structures and site improvements including excavation, fill, backfill and grading as shown on drawings and as herein specified.

1.04 SOIL REPORT

A. A copy of the soil report and test boring results is bound herein. This report is for information only and is not guaranteed for accuracy of existing conditions by Owner or Architect. Should this section conflict with requirements stated in the soils report, the soils report shall be governing. Notify the Structural Engineer as to those conflicts.

1.05 SAMPLES

A. Division 1 Section - Submittal Procedures: Procedures for submittals.

B. Submit samples of materials requiring laboratory testing in sufficient quantity necessary to adequately investigate soil.

1.06 JOB CONDITIONS

A. Maintain all existing and newly established bench marks. Report discrepancies found to the Architect, who reserves the right to make minor adjustments necessary to accomplish the intent of the Contract Documents, at no additional cost to the Owner. Contractor solely responsible for all elevations, dimensions, and verifications of conditions.

1.07 PROTECTION

A. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas and to prevent water runoff into excavation. Provide pumping as required to keep excavated areas free of water during construction. Ponding of water during construction shall be prevented at all times.

B. Provide adequate sheeting, shoring and bracing for excavations to prevent caving and to protect personnel.

C. Protect all building walls, curbs, and slabs against discoloration or damage from work under this Section.

D. Protection of existing landscape features indicated to remain as a portion of final landscaping.

E. Protect above and below grade utilities to remain.

1.08 OBSTRUCTIONS

A. Should utilities be encountered which interfere with the work, it is the Contractor's responsibility to notify the Owner and Architect. The Owner shall direct the Contractor to remove, relocate or cap off same.

PART 2 - PRODUCTS

2.01 STOCK PILING

A. Fill material required to be hauled in may be stockpiled at site until used, provided it is properly handled to prevent contamination with undesirable materials. Stock pile topsoil separate from excavated subsoil.

2.02 SURPLUS MATERIALS

A. Remove excavated materials not suitable for use in fills and backfills on this project from site. Materials containing rubbish, debris or rocks shall be removed.

2.03 MATERIALS

A. Fill: (at pavement) on site, inorganic soil free from vegetable matter, debris, and other deleterious matter capable of being compacted to 95% maximum density at optimum moisture content; ASTM D-698, or select fill.

B. Select Fill: (within building lines and beneath paving areas) Homogenous and non-expansive, having a plasticity index between 4 and 12, and a liquid limit less than 50. Select fill shall contain no rock greater that 4” in maximum dimension. Submit lab analysis for approval, complete with lab analysis of fill.

C. Topsoil: Clean, natural topsoil free of vegetation, debris, and other deleterious matter. Upper 6" of topsoil stripped from site may be used.

D. Sand Cushion Under Slabs on Grade: Pit run sand graded in accord with ASTM C136, free of organic matter, clays or other binder materials. Submit samples for approval.

E. Vapor Barrier: Division 07 Section.

F. Lime: Hydrated lime conforming to applicable sections of ASTM C-207, Type N. Lime quantity tickets supplied to Owner's testing lab upon delivery of each load.

G. Filter Fabric: Prefabricated drainage composite geotextile shall be Mirafi 140 Fabric at under-building drainage, or approved equal by JDR or Monsanto.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Strip objectionable materials from areas to be graded before grading operation begins. Excavate subsoil required for building foundation construction operations and other work. Excavations and rough grading shall be made to lines and grades shown and "feathered" into adjoining grades to insure a smooth transition. Maintain excavations so they drain and are kept free of excess water. Provide pumping as required. Fill over-excavated areas under structure-bearing surfaces in accord with directions of Owner.

B. Any materials resulting from operations that are unsuitable for use or disposal at the site shall become the property of the Contractor and be removed from the site.

C. Trenching for underground piping, electrical conduits, etc., shall be done by the trade installing the pipes, conduits, etc. Backfilling of trenches shall conform to the requirements for compacted select fill.

D. Abandoned Utility Lines and Sewers: Plug in accordance with utility company and/or local requirements any abandoned lines or pipes encountered during excavation using concrete plugs at least 6" thick and at a minimum distance of 3' outside improved areas.

E. Finish excavations within a tolerance of .05 foot above or 0.1 foot below required grades.

3.02 SUBGRADE PREPARATION AND FILLING

A. Lay out work to insure that all finish grades of all paving have the proper slope to insure proper drainage.

B. Establish new grades as necessary and verify all measurements and grades. Set all stakes, etc., to insure an engineering degree of accuracy.

C. Establish all grades and curbs of adjacent streets.

D. Scarify exposed subgrade to a depth of 6" and re-compact to a minimum of 98% of standard proctor density (ASTM D-698) at its optimum moisture content to 4% above its optimum moisture content.

E. Provide select fill material. Select fill material shall be placed in loose lifts of 6" to 8" thick and uniformly compacted to a minimum of 95% of standard proctor density (ASTM D-698) at minus 1% to plus 3% of its optimum moisture content.

F. Additional fill may be clean, on-site clays free of debris, vegetation, and organic material. Clay fill shall be placed in 8" maximum loose lifts at +5% to -3% of optimum moisture and compacted to 95% of the standard proctor dry density (ASTM D-698). Moisture content shall be maintained until pavement or additional fill is placed.

G. The cross-section of the finished subgrade shall be free from ridges or valleys and be within 0.05 of a foot above or below the theoretical section at any point on the cross-section.

H. Finished subgrade that does not conform to the above requirement shall be bladed and thoroughly re-compacted to conform to the requirements.

I. Clean surface or subgrade of all loose materials by brooming or other approved methods.

3.03 SOIL STABILIZATION

A. Subgrade of all paving shall be lime stabilized.

B. Insure that surfaces have been brought to approximate rough grades.

C. Loosen and pulverize soil to a compacted depth of 6" beneath designated paving areas including a distance of 2 feet outside perimeter of paving.

D. Mix soil and lime thoroughly by approved road mixer or other equipment until a homogeneous, friable mixture of soil and lime is obtained; free from all clods or lumps.

E. Begin compaction of the mixture immediately after final mixing. Aerate or sprinkler material as necessary to provide optimum moisture. Begin compaction at the bottom and continue until entire depth of the mixture is uniformly compacted.

F. A minimum of 7% hydrated lime (THD Item 264) (COG Item 4.6)should be used. Lime should be thoroughly mixed and blended with the top 6" of the subgrade (THD Item 260) and the mixture compacted to a minimum of 95% of ASTM D-698 at its optimum moisture content to 4% above its optimum moisture content.

G. Rework as necessary to obtain the specified density if any portion fails to meet the density specified.

H. Shape surface after mixture has been compacted to the required lines, grades and cross-sections and thoroughly roll with pneumatic or other suitable rollers sufficient light to prevent hair cracking.

I. Prepare only sufficient amount of subgrade in advance of placing paving, walks, curbs, etc., to enable the work to proceed smoothly and effectively.

3.04 BACKFILLING

A. Do not backfill against grade beams until after form work has been removed and concrete has set up. Backfill against grade beams so as to provide positive drainage away from the structure.

B. Finished subgrade surfaces generally not more than 0.5 inches above or below established grades. Tolerance for areas within 10 feet of building and all areas to be paved not more than .25 inches above or below established grades. Provide roundings at top and bottom of banks and at other breaks in grade. Unless otherwise noted, subgrade evenly sloped to provide drainage away from building walls, slope 1/4 inch per foot.

C. Compact backfill to 95% of maximum density at 2% below and 3% above optimum moisture content as determined by standard proctor test (ASTM D-698).

D. Backfill over filter fabric in tot lots with washed river gravel of 1/4 to 3/4” size and overlay with additional layer of filter fabric prior to installation of wood mulch.

3.05 VAPOR BARRIER

A. Place under all floor slabs on grade. Lap all joints 6" minimum and seal with compound recommended by manufacturer; seal around all openings through vapor barrier.

3.06 GRADING

A. After site has been cleared of construction debris, grade the site to the contours and spot elevation.

B. Ponding of water on the site will not be permitted. Finished grades shall not be more than 0.10 foot above or below established grade elevations.

3.07 PROTECTION, CLEAN-UP AND EXCESS MATERIAL

A. Protect grades from construction and weather damage, washing, erosion and rutting, and repair such damage that occurs.

B. Correct any settlement below established grades to prevent ponding of water.

C. Remove excess stock pile materials, debris, waste and other materials from site and leave work in clean, finished condition for final acceptance. Contractor is responsible for disposal of debris and excess materials.

3.08 FIELD QUALITY CONTROL

A. The Owner will employ and pay for services of an independent testing laboratory to perform inspection and testing services specified in this section.

B. Excavation: Observe the excavation process on a periodic basis, noting the exposed faces of the excavation. Immediately report any observed unsafe conditions.

C. Filling and Backfilling:
   1. The Contractor shall make available to the laboratory, adequate samples of each fill and backfill material from the proposed sources of supply not less than 10 days prior to the start of the work.
   2. The Laboratory shall analyze the samples as required to provide a soil description and to determine compliance with the quality requirements.
      a. Test for liquid limit in accordance with ASTM D423.
      b. Test for plastic limit of soils and plasticity index of soils in accordance with ASTM D424.
      c. Test for moisture density relations of soil in accordance with ASTM D698.
   3. Furnish a report for each individual test and state whether sample conforms to the specified requirements or reasons for nonconformance.
   4. Inspect and approve subgrade prior to placement of fill material.
   5. Make in-place compaction tests for moisture content, moisture-density relationship, and density of fill materials.
   6. Perform not less than two compaction tests for each 3,000 SF of surface for each layer of fill under the building and not less than two compaction tests for each 5,000 SF of surface for each layer of fill or undisturbed earth on areas of site to be covered by paving walks or traffic approaches.

D. Footing Excavations: Inspect footing excavations to determine that the proper bearing stratum is obtained and that excavations are properly clean and dry before concrete is placed.

END OF SECTION 31 22 00

SECTION 31 23 00 - EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Excavating and backfilling for structures, utilities, and pavement.
   2. Pipe bedding.
   3. Compacting fill materials.
   4. Borings and casings under roads.

B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.02 DEFINITIONS

A. Building Area Subgrade Pad: Portion of site directly beneath and within a line 10 feet beyond building and appurtenances including limits of any future building expansion areas indicated on Drawings.

1.03 SUBMITTALS

A. Division 1 Section - Submittal Procedures: Procedures for submittals.
   1. Assurance/Control Submittals:
      a. Material Source: Submit name of imported materials suppliers. Provide materials from same source throughout the work. Change of source requires Architect approval.
      b. Test Reports: Submit the following reports directly to Architect from Testing Laboratory, with copy to Contractor:
         1) Test reports on borrow material.
         2) Verification of each footing subgrade.
         3) Field density test reports.
         4) Optimum moisture-maximum density curve for each type of soil encountered.
         5) Report of actual unconfined compressive strength and bearing tests/results for each strata tested. Give "three-dimensional" description of each test location.

B. Division 1 Section - Closeout Submittals: Procedures for closeout submittals.
   1. Project Record Documents: Accurately record the following.
      a. Spot elevations for building area subgrade pad.
      b. Location of existing utilities remaining, re-routed utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROJECT CONDITIONS OR SITE CONDITIONS

A. Existing Conditions: Requirements specified in Division 2 Section.

B. Existing Utilities: Requirements specified in Division 2 Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stockpiled on-site fill and backfill material specified in Division 31 Section, tested by Testing Laboratory and approved by Architect.

B. Imported off-site fill and backfill material specified in Division 31 Section, tested by Testing Laboratory and approved by Architect.

C. Pipe Bedding Material: Processed sand and gravel free from clay lumps, organic, or other deleterious material complying with the following gradation requirements:

	SIEVE SIZE	PERCENT PASSING
a.	1 Inch	100
b.	3/4 Inch	90 to 100
c.	3/8 Inch	20 to 55
d.	No. 4	0 to 10
e.	No. 8	0 to 5

D. Steel Casing Pipe: AWWA C 200, minimum grade B; size and wall thickness as indicated on Drawings.

E. Stabilization Fabrics and Geogrids:
1. Mirafi 500X or 600X.
2. Amoco Style #2002 Woven.
3. Reemay Typar 3401 and 3601.
4. Trevira S1114 and S1120.
5. Tensar 1100 and 1200.

F. Filter/Drainage Fabrics:
1. Mirafi 140 N.
2. Amoco Style #4546.
3. Reemay Typar 3341.
4. Carthage Mills, Carthage 6%.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavation for filling and grading specified in Division 31 Section.

B. Rock excavation specified in Division 31 Section.

C. Excavation for Structures:
1. Excavate subbase for building foundations, slabs-on-grade and site structures to width and depth indicated on Drawings.
   a. Cut excavation banks vertically.
   b. Remove rocks, loose soil, and debris from bottom of excavation.
   c. Overexcavate wet or unsuitable soil from bottom of excavation.
   d. Provide stable base for concrete reinforcing installation and concrete placement.
   e. Hand trim to indicated lines and grades just prior to concrete reinforcing installation.
2. Provide protection for workers within trench areas in accordance with local, state, and national Occupational Safety and Health requirements and regulations.
   a. Trenches minimum 4 feet in depth.
3. During excavation, stockpile materials suitable for backfilling away from excavation to prevent overloading, slides, or cave-ins.
4. Remove material encountered in excavating operations that is unsuitable for backfilling, subgrade or foundation purposes as determined by Testing Laboratory and Architect. Dispose of materials off-site in an approved manner in accordance with requirements of authorities having jurisdiction.
5. Prevent surface water from flowing into excavations by temporary grading or other approved methods.
   a. Do not allow water to accumulate in excavations.

b. Remove accumulated water in excavations.
c. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components required to remove water from excavations.

D. Excavation for Utilities:
1. Excavate trench width and depth required for laying pipe, conduit, or cable. Cut trench banks vertical. Remove stones from bottom of trench as required to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as required to provide suitable base for continuous and uniform bedding.
2. During excavation, stockpile materials suitable for backfilling away from trench bank to prevent overloading, slides, or cave-ins.
3. Remove material encountered in trenching operations that is unsuitable for backfilling, subgrade or foundation purposes as determined by Testing Laboratory and Architect. Dispose of materials off-site in an approved manner in accordance with requirements of authorities having jurisdiction.
4. Prevent surface water from flowing into trenches or other excavations by temporary grading or other approved methods.
   a. Do not allow water to accumulate in excavations.
   b. Remove accumulated water in excavations.
   c. Provide and maintain pumps, well points, sumps, suction and discharge lines and other dewatering system components required to remove water from excavations.
5. Open cut excavation using trenching machine or backhoe. Do not use dirt clods for backfill created by use of machines other than ladder or wheel-type trenching machines.
6. Grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material along entire trench length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Do not excavate trench deeper, longer, or wider than required to make proper joint connection.
7. Excavate trench width below the top of pipe minimum 300 mm wide and maximum 460 mm wider than outside surface of pipe or conduit installed to elevations and grades indicated on Drawings. Excavate trench width for other pipe, conduit, or cable to least practical width allowing for proper compaction of trench backfill.
8. Excavate trench depth measured from finished grade or paved surface to the following requirements or applicable codes and ordinances:
   a. Water Mains: 30 inches to top of pipe barrel or 6 inches below frost line established by local building official, whichever is deeper.
   b. Sanitary Sewer: Elevations, and grades indicated on Drawings.
   c. Storm Sewer: Depths, elevations, and grades indicated on Drawings.
   d. Electrical Conduits: 24 inches minimum to top of conduit or as required by NFPA 70, or local utility company requirements, whichever is deeper.
   e. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
   f. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
   g. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.
9. Provide shoring, sheeting, and bracing, as required, in trenches and other excavations where protection of construction personnel is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

E. Excavation for Pavement:
1. Excavate roadway and pavement areas to line and grade indicated on Drawings.

2. Stockpile excavated material suitable for backfilling on-site.
3. Remove excavated materials not required or not suitable for backfill from site.
4. Overexcavate areas of pavement subgrade found to contain unsuitable material. Prepare, fill with suitable material, and compact as specified. Stabilize areas as specified in Division 31 Section.

3.02 PIPE BEDDING

A. Excavate trenches, for pipe or conduit installed to elevations indicated on Drawings, 4 inches below bottom of pipe and to width as specified. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel. After pipe installation, backfill and compact to top of trench.

B. Place geotextile fabric as indicated on Drawings.

3.03 BACKFILLING AND SUBGRADE PREPARATION

A. Backfilling:
   1. Verify that imported off-site fill and stockpiled on-site fill is tested and approved.
   2. Verify that foundation perimeter drainage installation is inspected and approved.
   3. Verify that foundation or below grade structure walls are braced to support surcharge forces imposed by backfilling operations.
   4. Verify that backfill areas are free of debris, snow, ice, or water, and that ground surfaces are not frozen.

B. Prepare building area subgrade pad in accordance with foundation subsurface preparation information indicated on Drawings and specified herein. Do not use rock larger than 6 inches for building subgrade fill.

C. Areas Exposed by Excavation or Stripping:
   1. Scarify areas exposed by excavation or stripping on which building subgrade preparations are to be performed to minimum 60 inch depth.
   2. Select Fill
      a. Depths of 3’ – 0” or less: Compact to minimum 95 percent optimum density in accordance with ASTM D698 (Standard Proctor) at minimum moisture content 2 percent below and maximum 2 percent above optimum moisture content.
      b. Depths of more than 3’ – 0”: Compact to minimum 100 percent optimum density in accordance with ASTM D698 (Standard Proctor) at minimum moisture content 2 percent below and maximum 2 percent above optimum moisture content.
   3. General Fill
      a. Compact to minimum 95 percent optimum density in accordance with ASTM D698 (Standard Proctor) at minimum moisture content 2 percent below and maximum 2 percent above optimum moisture content.
   4. Proofroll to detect any areas of insufficient compaction by making minimum of 2 complete passes with fully-loaded tandem-axle dump truck, or Architect approved equivalent, in each of two perpendicular directions under supervision and direction of Architect.
   5. Excavate and recompact areas failing to meet specified requirements.

D. Fill Material Placement:
   1. Place in 8 inch maximum lifts compacted as noted by fill type above.

E. Provide material imported from off-site with CBR (California Bearing Ratio) or LBR (Limerock Bearing Ratio) value equal to or above pavement design subgrade CBR or LBR value indicated on Drawings.

3.04 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades for elevations indicated on Drawings and specified conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density. Replace in a manner that will comply with compaction requirements as directed by Architect. Provide hard, uniform, smooth, stable surface, true to grade and cross-section after completion of compaction.

3.05 PROTECTION

A. Protect building subgrade pad and building related earthwork from damage by construction operations and erosion.

B. Prohibit vehicles from entering building subgrade pad area. Vehicles not permitted.

C. Scarify surface, reshape, and compact areas damaged by construction operations or weather erosion.

END OF SECTION 31 23 00

SECTION 31 25 00 - STORM WATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.01 SUMMARY

A. This section will consist of the completion and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor shall comply with all requirements of authorities having jurisdiction for preparation of and compliance with storm water pollution prevention including but not limited to the EPA, TCEQ, the City of where project is located, and all authorities having jurisdiction.

PART 3 - EXECUTION

3.01 EXECUTION

A. The Contractor will be responsible for preparation of, execution and implementation of the SWPPP, including construction of all required erosion control features, reporting other EPA and completion of inspection forms.
   1. SWPPP shall be prepared by licensed professional engineer in the State of Texas, or the state where the project is located, in compliance with requirements of authorities having jurisdiction.

END OF SECTION 31 25 00

SECTION 31 25 53 - SOIL EROSION AND SEDIMENT CONTROL

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. Section Includes: This section specifies soil erosion and sediment control work during construction, as shown. The work includes, but is not limited to, furnishing and installing straw bales or silt fence to form dikes or to form ditch, basin, and drop inlet erosion check; constructing earth perimeter dikes and overflow outlets; constructing crushed stone sediment traps and earth embankments; constructing sediment basins; constructing silt fences; placing riprap; and, furnishing and installing seed or sod for erosion control.

B. Related Sections include the following:
   1. Division 31 Section: Earthwork
   2. Division 31 Section: Excavation and Fill

C. The work performed under this section shall comply with the Storm Water Pollution Plan for this Project and with the requirements and intent of the NPDES Storm Water Discharge Permit program.

1.03 QUALITY ASSURANCE

A. The following Codes, Regulations, Reference Standards, and Specifications apply to work included in this section:

B. Codes and regulation of the jurisdictional authorities, including the NPDES general permit for storm water discharges associates with the construction activity.

C. "REFERENCE CODES AND STANDARDS":
   1. AASHTO: M-43 M182.
   2. ASTM: A112, A116, A584, C90, C140, C145, D4397.
   3. USDA: Soil Conservation Service Publication: Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas.
   4. Sampling and testing concrete masonry units shall be in accordance with ASTM C140.

1.04 SUBMITTALS

A. Submit the following for approval in accordance with Division 1 Section: "Submittal Procedures", and with the additional requirements as specified for each:

B. Certification of each item listed in this section with the appropriate samples, manufacturer's specifications and catalogue information.

C. Storm Water Pollution Prevention - Contractor Certification:
   1. Prior to commencement of construction activities, the Contractor shall submit to the City where the project is located, or to the Authorities having Jurisdiction, a signed copy of the following certification statement, to be filed with the Storm Water Pollution Prevention Plan (SWPPP):
   2. "I certify, under penalty of the law, that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site, identified as part of this certification".

PART 2 - PRODUCTS

2.01 STRAW BALES

A. Provide straw or hay bales approximately 36 inches long by 24 inches wide by 18 inches high; minimum 60 pounds, maximum 120 pounds each; bound with galvanized wire or nylon rope tied across stem lengths.

2.02 STAKES

A. Provide nominal 2 inches by 2 inches wooden stakes with sharpened ends or minimum 1/2-inch diameter steel picket rebar. Stakes: approximately 3 feet in length.

2.03 CRUSHED STONE

A. AASHTO M43: Size No. 2 or 24.

2.04 SEED AND SOD

A. As specified in Division 32 Sections: “Landscape Seeding” and “Turf and Grasses”.

2.05 APPROVED FILL

A. Fill material for embankments, dikes, and erosion checks: as specified in Division 31 Sections: “Earthwork” and “Excavation and Fill”.

2.06 TOPSOIL

A. As specified in Division 32 Sections: “Landscape Seeding” and “Turf and Grasses”.

2.07 JUTE MATTING (MESH)

A. Provide jute matting of a uniform, plain weave with wrap, and weft yarns of approximately the same size. The physical requirements shall be:
   1. Width: 45 inches to 48 inches, plus or minus one inch.
   2. 78 warp ends per width.
   3. 41 weft ends per yard.
   4. Weight - 1.80 lbs. (average) per running yard.

2.08 SILT FENCE MATERIALS

A. Silt Fence Fabric:
   1. One of the following:
      a. Burlap: AASHTO M182.
      b. Polypropylene fabric: ASTM D4397.
      c. Nylon netting reinforced fabric.
   2. Minimum bursting strength: 150 lbs.
   3. Edges treated to prevent unraveling.
   4. Furnished with 0-rings or clips to facilitate attachment to woven wire fabric.

B. Woven Wire Fabric: ASTM A116, Class 3 Coating; or ASTM A584, Class II Coating.

C. Posts:
   1. Steel, T-section, minimum 4 feet 6 inches long, minimum of 1.3 lbs. per foot without anchor plate.
   2. Anchor plate attached before coating.
   3. Fabricated with lugs or other approved means to prevent vertical movement of the woven wire fabric.

D. Coatings for Posts:
   1. Factory Painted:

a. Prime coat: As specified in Division 09 Section: "Painting" for steel.
b. Final Coat: Aluminum paint.

E. Tie Wire: Galvanized in accordance with ASTM A112.

PART 3 - EXECUTION

3.01 CONDITION OF SUBSTRATE

A. Examine the areas and conditions under which soil erosion and sediment control work is to be completed.

B. Stabilize fill and grade of areas to receive soil erosion and sediment control. Maintain positive drainage to sediment and erosion control devices during and after grading operations.

3.02 STRAW BALE DIKE INSTALLATION

A. Place bales in a row with ends abutting one another. Embed each bale in soil a minimum of 4 inches. Place anchor bales with two stakes driven through bales and sunk a minimum 1-1/2 feet into stabilized earth. Angle the initial stake toward previously laid bale to force bales together. Drive stakes flush with top bales. Remove bale dikes when no longer useful for controlling drainage and water flow.

3.03 STRAW BALE EROSION CHECK INSTALLATION

A. Ditch Erosion Checks:
1. Where ditches are cut into existing ground and side slopes, place ditch erosion checks, consisting of bales, across the ditch slope invert. Install at least two bales across the ditch invert. Install additional bales on the ditch slopes, as shown, or when directed. Stake two overlapping bales staked up each ditch side slope. Set overlaps tight to eliminate openings in the ditch erosion check.

B. Basin and Drop Inlet Erosion Check:
1. Where basins and drop inlets are located in the ditch line and off the paved areas, install baled straw erosion checks as shown. Protect entrance structures with straw bales staked upstream around drainage structure to ensure elimination add soil and silt from entering the underground drainage system. Stake one bale perpendicular to the flowline directly upstream from the inlet. Set two additional bales parallel to the flowline at each end of the bale. Stake all bales tightly against each other to eliminate any possible openings. Where shown, or when directed, embed the bales 4 inches into the ground around structures.

C. When the buildup of soil and silt behind the baled soil erosion checks reaches a height of 12 inches or when the checks are no longer functioning efficiently, remove the accumulated material. Bales shall be replaced every three months to maintain effectiveness of the sediment control measure.

D. Remove baled straw used for erosion checks when approved, or when the project is completed.

E. In no cases shall bales be left in ditches and around drainage structures after all construction is finished.

F. Curb Inlet Erosion Checks:
1. Protect entrance structure with straw bales paralleled with the gutter flowline to ensure elimination of soil and silt from entering the underground drainage system.

G. Shoulder Drain Erosion Check:
1. Where ballast drains are installed before placement of ballast, the following shall be installed. Install straw bale erosion checks as shown. Protect entrance structure with

straw bales staked around ballast drain to ensure elimination of soil and silt from entering the underground drainage system. All bales shall be tightly staked against each other to eliminate any possible openings. All straw bales around ballast drains shall be removed just prior to installation of ballast.

3.04 PERIMETER EARTH DIKE AND OVERFLOW OUTLET INSTALLATIONS

A. Construct dikes with suitable backfill material, machine compacted, with positive drainage to outlets. Divert runoff from protected and stabilized upland areas to outlets with stabilized soil or grade stabilization behind outlets. Divert runoff from disturbed and exposed upland area to sediment traps or basins. Level to grad both earth dikes and overflow outlets once the sod area has stabilized. Remove stones, roots, and other extraneous materials larger than 2 inches any dimension.

B. Construct overflow outlets in perimeter earth dikes of compacted crushed stone embedded a minimum of 4 inches into the earth dikes. Construct the crest of outlets approximately 6 to 8 inches below height of adjoining earth dike.

C. Remove overflow outlets from the site once the soil area has properly stabilized.

3.05 SEDIMENT TRAP AND EMBANKMENT INSTALLATIONS

A. Construct sediment traps as shown on the drawings using crushed stone at outlets, existing backfill and soil materials for embankments, with stabilizing cores consisting of straw bales, concrete blocks, or timber.
   1. Clear, grub, and grade areas under embankments and trap outlets prior to placing embankments. Clear pool areas.
   2. Where used as core material for outlets and embankments, anchor straw bales in place with two stakes per bale. Drive stakes through bales and into stabilized soil a minimum of 1-1/2 feet.
   3. Place and compact embankment material.
   4. Place and compact crushed stone solidly over core at outlets. Crest of outlets shall be approximately 10 to 12 inches below height of adjoining embankment.
   5. Unless otherwise shown, construct cut and fill slopes at 3:1, or flatter.
   6. Place jute matting (mesh) over embankments as shown. Securely anchor matting with stakes or stays.
   7. When sediment has accumulated to 1/2 the design depth of the trap or 1 foot, whichever is less, remove sediment and deposit such material in a previously approved area which is free of erosion.
   8. Remove sediment traps and embankments once the soil area has been properly stabilized as determined by the Architect.

B. Construct sediment basins in compliance with the “Standard and Specifications for Sediment Basin” as published by the U.S. Department of Agriculture Soil Conservation service in its volume “Standards and Specification for Soil Erosion and Sediment Control in Developing Area”.

3.06 SODDING

A. Perform sodding work when temperatures are 40 deg. F or higher. Do not place sod when ground surface is frozen or during extended drought.

B. Loosen subgrade of areas to be sodded and apply topsoil mixture over the area.

C. Lay sod within 20 hours from time of stripping.

D. Peg sod on slopes as required to prevent slippage. Use 1 inch by 1 inch by 6 inch wooden pegs with one end sharpened.

E. Provide fertilizer and soil amendments as required to maintain healthy sodded areas.

F. Sod areas to the limits indicated on drawings.

G. Stabilize channel flow areas disturbed by the Contractor's operations with specified sod. Sod invert of ditches to 2 feet above invert.

3.07 SEEDING

A. Place and prepare topsoil as specified in Division 32 Sections: "Landscape Seeding" and "Turf and Grasses".

B. Place seed and fertilize as specified in Division 32 Sections: "Landscape Seeding" and "Turf and Grasses".

3.08 SILT FENCE

A. Install steel posts on a minimum of 8 foot centers. Minimum embedment of 1 foot 6 inches.

B. Minimum height of the silt fence to be 2 feet 6 inches with a 6 inch clearance between the top of the silt fence and the top of the posts.

C. Install the steel posts on a slight angle towards the anticipated runoff surface.

D. Trench in the toe of the silt fence so that the downslope faces of the trench is flat and perpendicular to the lie of flow.

E. Minimum trench depth: 6 inches.

F. Trench width: 3 to 4 inches.

G. Attach welded wire fabric to the posts.

H. Attach the silt fence fabric to the welded wire fabric and secure with a minimum of two wraps.

I. Backfill over the silt fence fabric.

J. When build up of soil, silt, or any other material behind the silt fence reaches a height of 6 inches or when the fence is no longer functioning efficiently, remove all accumulated material. The accumulated material shall be disposed of as set forth in Division 01 Section: "Construction Waste Management".

3.09 CONTROL AND DISPOSAL OF EXCESS MATERIAL, TRASH, DEBRIS, AND EFFLUENT

A. Dispose of excess excavated material that is approved by the Architect as clean fill if an onsite soil disposal areas has been approved. If no such site is approved, dispose of material in accordance with the provisions of Division 01 Section: "Construction Waste Management". Small amounts of material generated by excavation for fencing, etc. may be exempted from this provision. In all cases the provisions of Division 01 Section: "Construction Waste Management" apply to the onsite disposal of excavated material.

B. Pick-up trash and place in containers. Empty containers on a regular schedule. Conduct handling and disposal to prevent contamination of the site and others areas. Do not dispose of in wetlands and do not burn on the Right-of Way (ROW). On completion, leave the disposal areas clean.

C. Dispose of rubbish and debris as follows:
   1. Transport all waste off the site and dispose of in a manner that complies with State, and local requirements. Secure a permit or license prior to transporting any material off the site. Submit copies of approval documents from appropriate Authorities to the Architect prior to use of the disposal sites. Do not burn waste materials on site.

D. Effluent:
   1. The Contractor shall take all necessary measures to assure compliance with the requirements of the NPDES Storm Water Discharge Permit obtained for this Project, and with the Storm Water Pollution Prevention Plan developed for this Project.

3.10 PROTECTION AND MAINTENANCE

A. Protect erosion and sediment control devices from damage. Repair and replace dikes, erosion checks, sediment traps, silt fences, overflow outlets, and other measures when damaged by construction, natural, and other physical causes. All soil erosion and sediment control device shall be repaired or replaced at the expense of the contractor and shall function as originally intended.

B. Periodically (at least once every 7 days and after each rainfall event) inspect and maintain erosion and sediment control structures, until final stabilization is achieved.

C. Maintain sod by watering, fertilizing, weeding, mowing, and trimming. Replace sod which has been eroded, damaged by construction activities, deteriorated, or diseased.

D. All stockpiled soil shall be surrounded by a straw bale dike or silt fence to properly control sediment runoff. All material and labor required to install and maintain the erosion control at soil stockpiles shall be included in the Contract.

E. Inspection services provided by the project City's representative do not relieve the Contractor's responsibility for inspection and maintenance of the erosion control measures, or his duty to comply with the Storm Water Pollution Prevention Plan and the conditions of the NPDES General Permit.

3.11 ACCEPTANCE

A. Soil erosion and sediment control devices will be acceptable, provided that they are in good condition and functioning as intended.

B. Sodded areas will be acceptable, provided that all requirements, including maintenance, have been complied with, and a healthy, well-rooted, even-colored, viable sod is established.

3.12 STAGING AREAS

A. At such time when the specific location of the staging areas are determined, silt fences, straw bale dikes, or equivalent sediment controls are required for all sideslope and downslope boundaries of the staging area or a detention basin providing storage for runoff from the staging area from a 10 year, 24-hour storm shall be provided. This erosion control plan shall be approved by the Architect and shall be in place prior to occupation of the staging areas. All relative material and labor to construct and maintain the staging area erosion control plan shall be subsidiary to the other items of work. Plan, schedule, and undertake work in a manner that will ensure protection and preservation of existing wetlands and water courses identified by the Corps of Engineers and the U.S. Fish and Wildlife Service

3.13 VEGETATIVE PRACTICES

A. Temporary seeding, permanent seeding, mulching, or sod stabilization procedures, or their equivalent, must be initiated on all disturbed areas within 14 calendar days of last activity in that area. Temporary seeding, or sod and/or soil stabilization procedures will not be paid for directly, but will be considered subsidiary to the Contract. All permanent soil stabilization procedures shall be installed, measured, and paid for by the Contractor, and shall be in accordance with Division 32 Sections: "Landscape Seeding" and "Turf and Grasses".

END OF SECTION 31 25 53

SECTION 31 31 16 – TERMITE CONTROL

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. Section Includes: Furnish and install a chemical barrier to afford the structure protection from termites and other common ground insects
   1. Soil treatment for termite control.

B. Related Sections include the following:
   1. Division 01, Section "Temporary Facilities and Controls", for pest control requirements during and at conclusion of construction period.
   2. Division 06, Section "Rough Carpentry", for wood preservative treatment by pressure process.
   3. Division 07, Section "Vapor Barrier".

1.03 QUALITY ASSURANCE

A. Comply with all applicable regulatory and environmental requirements.

B. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.
   1. Any chemicals toxic to animals and plant life should be applied with caution by an experienced person who is licensed in accordance with the regulatory agency of the State.

C. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

D. Preinstallation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

A. Action Submittals: Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
   2. Include the EPA-Registered Label for termiticide products.

B. Informational Submittals:
   1. Qualification Data: For qualified Installer.
   2. Product Certificates: For each type of termite control product.
   3. Sample Warranties.

C. Closeout Submittals: Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and inclusion in O&M Manuals. Include the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Termiticide brand name and manufacturer.

4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.06 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that project has been registered with Manufacturer to meet the required Warranty criteria, provide termite control work for the duration of the Warranty, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Corporation, Agricultural Products; Termidor.
      b. Bayer Environmental Science; Premise.
   2. Pest Control Contractors: Subject to compliance with requirements, acceptable applicators include but are not necessarily limited to:
      a. Terminix
      b. Orkin
      c. Myers
      d. Metrogard
   3. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

B. Materials shall be used, provided:
   1. They are determined to meet five (5) year test conducted by the U.S. Forest Service, or the U.S. Department of Agriculture.
   2. Evidence is provided indicating any toxic effects to humans, plants or animal life.
   3. Allowed by governing laws and/or ordinances.

PART 3 - EXECUTION

3.01 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.02 APPLYING SOIL TREATMENT

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

D. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
   3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

F. Post warning signs in areas of application.

G. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

H. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

SECTION 31 32 13 - LIME SOIL STABILIZATION

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. Section Includes:
   1. Lime mixing (dry or slurry) into the subgrade for stabilization.

B. Related Sections include the following:
   1. Division 31 Section “Earthwork.”

1.03 SCOPE

A. Furnish labor, materials, services, equipment and appliances required for lime stabilized paving sub-base work indicated on the drawings and specified herein.

B. Provide a completed course of treated material containing a uniform lime mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses. Contractor is responsible to regulate sequence of work, to use proper amount of lime, maintain the work and rework as necessary to meet above requirements.

1.04 STANDARDS

A. Meet requirements and recommendations of applicable portions of:
   1. American Society for Testing Materials (ASTM);
   2. American Association of State Highway Officials (AASHO).

1.05 SUBMITTALS

A. Submit manufacturer's certificate indicating lime to be furnished meets specified requirements.

1.06 TESTING LABORATORY SERVICES

A. The Owner shall pay for the services of a qualified soils laboratory to provide testing for this section, and shall be done as per the Geotechnical Report, and as follows:
   1. Qualified soils personnel on site for stabilization inspection.
   2. The laboratory representative shall take samples and make adequate inspections to determine that the proper soil stabilization has been obtained.
   3. The lab shall furnish a complete report showing :
      a. Plasticity Index for Lime Stabilized Soil Mixture per ASTM D2217.
      b. Lime quantity tickets.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lime: One of the following based on "Mix" determined for use:

1. Type "A": Hydrated lime; dry power consisting of calcium hydroxide or a mixture of calcium hydroxide and small amounts of calcium oxide, magnesium oxide and magnesium hydroxide. Content by weight:
   a. Calcium Hydroxide (Active Lime): Min. 90%.
   b. Calcium Oxide (Unhydrated Lime): Max. 5%.
   c. Free Water: Max. 4%.
2. Type "B": Commercial lime slurry; pumpable suspension of solids in water; solids portion of mixture consisting principally of hydrated lime. Content by weight:
   a. "Solids" Hydrate Alkalinity: Min. 87%.

B. Water: City tap water.

2.02 EQUIPMENT

A. Suited for purpose intended. Maintain equipment in good operating condition.

2.03 MIX

A. Contractor employ and pay for, as part of contract price, the services of an Owner-acceptable independent testing laboratory to determine mix required to achieve a plasticity index of 15 or less and to comply with requirements specified hereinafter. Include type and quantity of lime, application rates, equipment types, placing and mixing procedures, and curing. Seven percent lime content by volume is minimum (THD Item 264, COG Item 4.6) requirement of these specifications.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

A. Deliver in unopened containers clearly marked with certified weights. Store in weatherproof containers, bins or buildings.

3.02 INSPECTION OF SUBGRADE

A. Inspect subgrade for compaction of fill and surface tolerances. Do not begin stabilization until subgrade is acceptable.

3.03 PREPARATION

A. Scarify subgrade to depth shown on drawings for sub-base. Correct unstable material below required depth by proper compaction.

B. Lime Application: Use either "Dry Placing" or "Slurry Placing" method. Distribute uniformly over scarified subgrade at rate required by "Mix". Place only the amount of area to allow first mixing operation to be completed the same working day:
   1. Dry Placing: Use screw type spreader box or bag distribution. Do not spread with maintainer or motor grader. Do not place lime during windy or other adverse weather conditions. Sprinkle until proper moisture content has been secured.
   2. Slurry Placing: If type "A" lime is to be used as slurry, mix lime with water in trucks. Place slurry using acceptable distributor. Make successive passes over measured section of area to be treated until proper lime and moisture content as determined by "Mix" has been secured. Furnish truck with approved agitator which will keep lime and water uniformly mixed. Do not change grade of slurry without prior acceptance.
   3. Mixing: Procedure is the same for either "dry placing" or "slurry placing". Mix until uniform mixture and moisture content is achieved.
      a. First Mixing: Thoroughly mix soil and lime to required depth, using pulver-type mixer. mix until homogeneous, friable mixture of lime and soil is obtained, free of

clods or lumps. Add proper moisture and cure as directed by "Mix". Keep moist during curing period.

b. Final Mixing: After curing, uniformly mix soil and lime using pulver-type mixer. Reduce size of clods or lumps by pulverization.

4. Compaction: Begin compaction immediately after final mixing. Provide optimum moisture during compaction. Begin at bottom and compact until entire required depth is uniformly compacted. Compact treated material in such a manner that it will not be mixed with underlying material. Correct irregularities or weak spots immediately by replacing material and recompacting. Maintain surface in smooth condition until pavement is placed. Acquire density of at least 95% of standard density at optimum moisture content of treated material; AASHO Standard T-99 or ASTM D698-66T at its optimum moisture content to 4% above its optimum moisture content. Use pneumatic-type roller for final surface rolling.
5. Curing: Moist-cure compacted subgrade section for minimum of 7 days before placing paving.

3.04 CLEAN-UP

A. Upon completion of work of this section, remove related debris from premises.

END OF SECTION 31 32 13

SECTION 32 12 16 - BITUMINOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Bituminous concrete paving.
   2. Surface course.
   3. Binder course.
   4. Paving base course.

B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:
   1. Division 31 Section - Earthwork: Earthwork for Pavement.
   2. Division 32 Section - Plain Cement Concrete Paving: Concrete paving, curbs and sidewalks.
   3. Division 32 Section - Pavement Markings: Painted pavement markings.

1.02 REFERENCES

A. Asphalt Institute (AI):
   1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
   2. AI MS-3 - Asphalt Plant Manual.
   3. AI MS-8 - Asphalt Paving Manual.
   4. AI MS-19 - Basic Asphalt Emulsion Manual.

B. American Society for Testing and Materials (ASTM):
   1. ASTM D 242 - Specification for Mineral Fiber for Bituminous Paving Mixtures.
   2. ASTM D 698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 Pound Rammer and 12 inch Drop.
   3. ASTM D 1188 - Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.
   4. ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18 inch Drop.
   5. ASTM D 1560 - Test Method for Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus.
   6. ASTM D 2397 - Specification for Cationic Emulsified Asphalt.
   7. ASTM D 2399 - Practice for Selection of Cutback Asphalt.
   8. ASTM D 2726 - Test Method for Bulk Specific Gravity and Density of Nonabsorbative Compacted Bituminous Mixtures.
   9. ASTM D 3381 - Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
   10. ASTM D 3549 - Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
   11. ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

C. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO T 88 - Particle Size Analysis of Soils.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide asphalt-aggregate mixture as recommended by local or state paving authorities to suit project conditions. Use locally available materials and gradations which meet standard state highway specifications and exhibit satisfactory records of previous installations.

1.04 SUBMITTALS

A. Division 1 Section - Submittal Procedures: Procedures for submittals.
   1. Assurance/Control Submittals:
      a. Design Data:
         1) Submit design mix following format indicated Asphalt Institute Manual MS-2, Marshall Stability Method; including type/name of mix, gradation analysis, grade of asphalt cement used, Marshall Stability (pounds), flow, effective asphalt content (percent), and direct references to applicable state highway department specification sections for each material.
         2) Provide design mixture listed in current edition of applicable state highway department specifications.
         3) Use mix designs prepared within 3 years maximum.
         4) Provide documentation of state highway limitations, if any, on use of recycled content materials.
      b. Certificates: Submit materials certificate to Testing Laboratory signed by material supplier and Contractor, certifying that materials comply with, or exceed, the requirements specified herein.
      c. Qualification Documentation: Paving installer documentation of experience indicating compliance with specified qualification requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with AI MS-8

B. Installer Qualifications: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

C. Regulatory Requirements:
   1. Conform to applicable requirements for paving work on public property.
   2. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Use temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.06 PROJECT CONDITIONS OR SITE CONDITIONS

A. Jobsite Requirements:
   1. Apply prime and tack coats when ambient temperature is above 40 degrees F, and when temperature has been above 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, or during rain.
   2. Construct bituminous concrete paving when atmospheric temperature is above 40 degrees F.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Resource Management:
   1. Recycled Content: Provide aggregate fabricated from a minimum of 30% recycled rubble or concrete. Provide asphalt cement fabricated from recycled content asphalt.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Base Course: As indicated on Drawings, complying with applicable state highway specifications regarding source, quality, gradation, liquid limit, plasticity index and mix proportioning.
   1. Unless otherwise specified in applicable state highway specifications, provide base course aggregate fabricated from minimum 30 percent recycled rubble or concrete.

B. Asphalt Cement: Fabricated from minimum 15 percent recycled asphalt and complying with ASTM D 3381; Table 2 AC-10, AC-20, or AC-30, viscosity grade, depending on local mean annual air temperature as indicated below:

TEMPERATURE CONDITION	ASPHALT GRADES
Cold, mean annual air temperature at 45 degrees F or lower	AC-10 85/100 pen.
Warm, mean annual air temperature between 45 degrees F and 75 degrees F	AC-20 60/70 pen.
Hot, mean annual air temperature at 75 degrees F or higher	AC-30

C. Prime Coat: A medium curing cut-back asphalt or an asphalt penetrating prime coat consisting of either ASTM D 2397 or ASTM D 2399, MC- 30 or SS-1h.

D. Tack Coat: Emulsified asphalt; ASTM D 2397 or ASTM D 2399, SS-1h, CSS-1, or CSS-1h, diluted with one part water to one part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M-17/ASTM D 242, if recommended by applicable state highway department standards.

F. Asphalt-Aggregate Mixture: Unless otherwise indicated on Drawings, the Design Mix shall have a minimum stability based on a 50-blow Marshall complying with ASTM D 1559 of 1000 pounds with a flow between 8 and 16. The Design Mix shall be within sieve analysis and bitumen ranges below:

2.02 EQUIPMENT

A. Maintain equipment in satisfactory operating condition and correct breakdowns in a manner that will not delay or be detrimental to progress of paving operations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 1 Section - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to for earthwork operations to begin.
   1. Verify gradients and elevations of base are correct, and base is dry.

C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 BASE COURSE PLACEMENT

A. Perform base course construction in a manner that will drain surface properly at all times and at the same time prevent runoff from adjacent areas from draining onto base course construction.

B. Compact base material to not less than 98 percent of optimum density as determined by ASTM D 698 or 95 percent of optimum density, as determined by ASTM D 1557, unless otherwise indicated on the Drawings.

C. Granular Base: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 8 inches, measured loose.

D. Sand/Shell Base: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 4 inches, measured loose.

E. Asphalt Institute Type IV Mix for Full Depth Asphalt Base: Construct to thickness indicated on Drawings in lifts or layers not exceeding 3 inches, measured loose.

F. Asphalt Institute Type VI, VII, or VIII Mixes for Hot-Mix Sand Asphalt Bases: Construct to thickness indicated on Drawings. Apply in lifts or layers not exceeding 3 inches, measured loose.

G. Soil Cement Stabilized Base: Construct to thickness and strength as indicated on Drawings and in accordance with applicable state highway specifications. If not indicated on the Drawings, the minimum compressive strength shall be 500 pounds per square inch, tested at 28 days.

3.03 APPLICATIONS

A. Prime Coat:
   1. Apply bituminous prime coat to all base material surfaces where bituminous concrete paving will be constructed.
   2. Apply bituminous prime coat in accordance with applicable state highway specifications.
   3. Apply at minimum rate of 0.25 gallon per square yard over compacted base material. Apply to penetrate and seal, but not flood surface.
   4. Make necessary precautions to protect adjacent areas from overspray.
   5. Cure and dry as long as necessary to attain penetration of compacted base and evaporation of volatile substances.

B. Tack Coat:
   1. Apply to contact surfaces of previously constructed bituminous concrete base courses or portland cement concrete and surfaces abutting or projecting into bituminous concrete or into bituminous concrete pavement.
   2. Apply tack coat to bituminous concrete base course or sand asphalt base course. Apply emulsified asphalt tack coat between each lift or layer of full depth bituminous concrete and sand asphalt bases and on surface of all such bases where bituminous concrete paving will be constructed.
   3. Apply emulsified asphalt tack coat in accordance with applicable state highway specifications.
   4. Apply at minimum rate of 0.05 gallon per square yard of surface.
   5. Allow to dry until at proper condition to receive paving.

3.04 BITUMINOUS CONCRETE PLACEMENT

A. Place bituminous concrete mixture on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum temperatures:

1. When ambient temperature is between 40 degrees F and 50 degrees F, mixture temperature equal to 285 degrees F.
2. When ambient temperature is between 50 degrees F and 60 degrees F, mixture temperature equal to 280 degrees F.
3. When ambient temperature is higher than 60 degrees F, mixture temperature equal to 275 degrees F.

B. Whenever possible, all pavement shall be spread by finishing machine. Inaccessible or irregular areas may be placed by hand methods. Hot mixture shall be spread uniformly to required depth with hot shovels and rakes. After spreading, the hot mixture shall be carefully smoothed to remove all segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be of the type designed for use on asphalt mixtures. Loads shall not be dumped faster that they can be properly spread. Workers shall not stand on the loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of bituminous concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10 feet wide.

D. Joints: Make joints between old and new pavements, or between successive days and work in a manner that will provide a continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of bituminous concrete course. Clean contact surfaces of all joints and apply tack coat.

3.05 ROLLING AND COMPACTION

A. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. The number, weight, and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in a workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot bituminous concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.06 CONSTRUCTION

A. Site Tolerances:
1. Paving Surface Smoothness: Maximum allowable 10 foot straightedge tolerance for smoothness.

a. Base Course Surface: 1/4 inch.
b. Wearing Surface Course: 3/16 inch.

3.07 FIELD QUALITY CONTROL

A. Division 1 Section - Quality Control: Field inspection and testing procedures

B. Site Tests:
1. Paving Base Course: Perform testing of in-place base courses for compliance with requirements for thickness, compaction, density, and tolerance.
a. Moisture/Density Test: ASTM D 698 or ASTM D 1557.
b. Mechanical Analysis Test: AASHTO T-88.
c. Plasticity Index Test: ASTM D 4318.
d. Base Material Thickness Test: Minimum one test for every 20,000 square feet.
e. Base Material Compaction Test: Minimum one test for every 20,000 square feet.
f. Field Density Tests: Perform testing of in-place base courses for compliance with requirements for density using one of the following methods:
1) Sand-cone Method: ASTM D 1556.
2) Balloon Method: ASTM D 2167.
3) Nuclear Method: ASTM D 2922, Method B (Direct Transmission).
2. Asphalt Concrete Paving: Perform testing of in-place asphalt concrete paving courses for compliance with requirements for thickness, compaction, and surface smoothness.
a. Thickness: ASTM D 3549; Thickness shall not be less than thickness specified on Drawings.
b. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt paving course using 10 foot straightedge applied parallel with, and at right angles to centerline of paved areas. Smoothness shall not be less than tolerances specified herein.
3. Compaction: Field density test for in place materials shall be performed by examination of field cores in accordance with one of the following standards:
a. Bulk Specific Gravity of Paraffin-Coated Specimens: ASTM D 1188, minimum one core per 20,000 square feet.
1) Standard Duty Areas: Minimum 3 cores.
2) Heavy Duty Areas: Minimum 3 cores.
b. Bulk Specific Gravity Using Saturated Surface-Dry Specimens: ASTM D 2726, minimum one core per 20,000 square feet.
1) Standard Duty Areas: Minimum 3 cores.
2) Heavy Duty Areas: Minimum 3 cores.

END OF SECTION 32 12 16

SECTION 32 13 13 - CONCRETE PAVING

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. Section Includes:
   1. Provide concrete paving including broom finished paving and walks, curbs and gutters. Restore paved areas opened or damaged in performance of the work required by the Contract Documents.

B. Related Sections include the following:
   1. Division 1 Section “Laboratory Testing.”
   2. Division 3 Section “Concrete Formwork.”
   3. Division 3 Section “Cast-in-Place Concrete.”
   4. Division 7 Section “Joint Sealants.”
   5. Division 31 Section “Earthwork.”

1.03 SUBMITTALS

A. Division 1 Section - Submittal Procedures: Procedures for submittals.

B. Concrete Design: Contractor shall be responsible for and shall pay for design of concrete mixes. An independent testing laboratory shall determine design mixes of each type concrete based on specified strengths and materials in accordance with ACI 318-89. Submit 4 copies of each design mix for approval.

C. Division 01 Section - Submittal Procedures: Procedures for submittals.
   1. Product Data: Submit product data for the following:
      a. Joint filler.
      b. Joint sealant.
      c. Concrete admixtures.
      d. Concrete curing compounds.
   2. Assurance/Control Submittals:
      a. Concrete Mix Design: Submit three copies of each proposed mix design for each class of concrete in accordance with ACI 301, Sections 3.9 "Proportioning on the basis of previous field experience or trial mixture", or 3.10 "Proportioning based on empirical data". Submit separate mix design for concrete to be placed by pumping, in addition to the mix design for concrete to be placed directly from the truck chute.
      b. Include the following information in concrete mix design:
         1) Proportions of cement, fine and coarse aggregate, and water.
         2) Water-cement ratio, 28-day compressive design strength, slump, and air content.
         3) Type of cement and aggregate.
         4) Aggregate gradation.
         5) Type and dosage of admixtures.
         6) Special requirements for pumping.
         7) Range of ambient temperature and humidity for which design is valid.
         8) Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Conform to ACI 305R when mixing and placing concrete during hot weather.

C. Conform to ACI 306R when mixing and placing concrete during cold weather.

D. Regulatory Requirements:
   1. Conform to applicable requirements for paving work on public property.
   2. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.05 COORDINATION

A. Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation of their work.

1.06 STANDARDS

A. American Society for Testing Materials (ASTM).

B. American Concrete Institute ACI-617 "Standard Specifications for Concrete Pavement and Bases". ACI-396 "Manual of Standard Practice for Detailing Reinforced Concrete".

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C-150-78a, Type I or III.

B. Fine Aggregate: Natural sand, ASTM C-33-78.

C. Coarse Aggregate: Hard, durable natural gravel or crushed rock meeting requirements of ASTM C-33-78. Maximum size and gradation in accordance with Size No. 67 or 467 in Table II of ASTM C-33.

D. Grading: ASTM C-136.

E. Water: Potable.

F. Reinforcing Steel: ASTM A615, grade 60 or as noted on drawings.

G. Dowels and Sleeves: 3/4" plain round bars, with plastic sleeve at one end, 24 inches long, allowing one inch of movement. Refer to drawings.

H. Forms: Nominal 2" thickness dimension fir, or steel paving forms.

I. Premolded Expansion Joint Filler: ASTM D-994, asphaltic.

J. Dispersing Admixture: Cement-dispersing, water reducing compound complying with ASTM C-494 such as Pozzolith 100 series, as made by Master Builders.

K. Curing Compound at Standard Paving: ASTM C-309, No. 40W by A. C. Horn Co., Kure-N-Seal by Sonneborn or Clear Bond by Guardian Chemical.

L. Air Entraining: ASTM C-0260 by Master Builders or equal.

M. No fly ash will be permitted.

2.02 PROPORTIONING AND MIXING

A. Proportions and Design: Concrete shall produce a mixture of adequate workability, free from segregation, honeycombing and bleeding, and shall be of following types:

1. Schedule of Types of Concrete:

Type	Min. All. Comp.			Max. Size of
Type	Strength (28 days)	Cement	% Air	Aggregates
I	4000 psi	Gray P	5%	1-1/2"

2. Locations of Types of Concrete: Broom finish all paving. Sidewalk and paving thicknesses as noted on drawings.
3. Admixture: Add specified cement-dispersing agent, color admix (where specified) and air-entraining agent to concrete mixes.

B. Mixing: Ready mixed concrete in accordance with ASTM C-94-67.

C. Slump: Shall not exceed 5" or less than 3" per ASTM C-143.

D. Air Entrainment: Air content by volume as per ASTM C231 shall be 5% to 7% based on measurements made in concrete mixtures at point of discharge at job site.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Inspect subgrade and report any discrepancies to Architect before proceeding.

3.02 FORMWORK

A. Build forms to lines and grades detailed, of sufficient strength and rigidity so they will not deflect under pressure of wet concrete. Exercise extreme care in layout, bracing, and aligning forms. Formwork shall be straight, with no bulges in completed work greater than 1/8" in 10 feet.

3.03 REINFORCING

A. Place reinforcing steel as detailed and in accordance with ACI 318-89. Place wire mesh to provide one full mesh lap at sides, minimum 8" at ends. Lap bars 36 bar Diameters. Metal chairs shall be used to hold reinforcing steel in the proper plane. Place dowels and sleeves at expansion joints at 24" O.C. maximum. Refer to drawings.

3.04 PLACING

A. Concrete: Convey and place concrete so there is no separation of ingredients in accordance with applicable requirements of Chapter 10 ACI Standard Specifications for Concrete Pavements and Concrete Bases (ACI 617-Current Edition). Do not place concrete when temperature is below 40 degrees F. No calcium chloride shall be added to the concrete. Do not place concrete which exceeds 95 degrees F., and add a retarder, if required, to all concrete which is between 90 and 95 degrees F. Ice shall be used to control the maximum temperature.

B. Construction Joints: Stoppage of concrete placing shall occur at expansion joint or other detailed contraction joints. Construct bulkheads to permit continuation of reinforcing steel.

C. Expansion Joints: Place 1/2" asphaltic expansion joint material where paving abuts existing paving, structure, walls or fixed objects. Place at every 60 feet each way in paving, every 30 LF in curbs and walks and at other locations detailed. Provide 1/2" wide expansion joint filler between curbs and concrete paving. Provide removable tacked-on strips to provide a recess for joint sealing compound. 3/4" Dowels, 24" long shall be placed at 24" O.C. through expansion joints, sleeved one side, at all expansion joints except where joint abuts building, unless noted otherwise.

D. Saw-Cut Contraction Joints: Saw-cut joints when concrete is hard enough not to be torn, raveled, or damaged by saw cutting equipment and no later than 10 hours after concrete placement. Trial cuts shall be made prior to execution. Use a power drive concrete saw. Saw blades shall make a clean, smooth cut, producing a groove 1/8" to 1/4" wide to depth required (1/4 slab depth). Locate contraction joints nominally at 12'-0" O.C., unless specified otherwise on Drawings. All joints shall receive sealant.

3.05 FINISHING

A. Materials exposed to view free of surface defects such as poor joints, ridges, cracks, honeycombing, excessive laitance, stone pockets or other defects. Materials that are defective and cannot be satisfactorily repaired, removed and replaced at the Contractor's expense.

B. Concrete cured by use of curing compound applied after surfaces take initial set after finishing. Use color matched curing system as recommended by manufactrer of integral color at colored concrete.

C. General Paving and standard Sidewalks: Finish surface to gritty texture with stiff bristle push broom using straight continuous strokes. Finish all edges smooth with 1/8" to 1/4" radius.

D. Vibrate, screed and float concrete to level and test the surface, which shall not vary over 1/4" in 10' when tested with a ten foot straight edge.

E. Finish all vertical surfaces in a manner that leaves the exposed surfaces free of honeycombing and form marks. Any damaged surfaces shall be repaired and stone rubbed to match adjacent finished surfaces.

3.06 CURING

A. Apply a white-pigmented type curing compound at a uniform rate of approximately 200 SF/Gallon, or as recommended by curing compound manufacturer as soon as the finishing operation has been completed and the concrete has lost its water sheen. The curing procedure must protect the concrete, including all exposed surfaces against loss of moisture and rapid temperature change for a period of not less than four days from the beginning of the curing operations and without damage to, or marking of the finished concrete surface. Traffic shall not be allowed on finished concrete of a minimum period of seven days.

B. At colored concrete apply color matched curing system as recommended by the manufacturer.

3.07 CLEANING

A. Concrete approaches, sidewalks, and related work shall be hosed down with water, scrubbed with fiber brushes, allowed to dry and be left broom clean and in condition acceptable to the Owner.

END OF SECTION 32 13 13

SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Concrete pavers over sand leveling bed.
   2. ADA Detectable surface pavers set in mortar setting bed.

B. Related Sections:
   1. Division 32 Section " Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete sidewalks and curbs serving as edge restraints for unit pavers.
   2. Division 32 Section - Irrigation for sleeves and coordination with irrigation lines installed under areas of pavers.
   3. Division 33, for coordination with any other utilities installed under areas of pavers.

1.03 SUBMITTALS

A. Product Data: For materials other than water and aggregates.

B. Product Data: For the following:
   1. Pavers.
   2. Mortar and grout materials.

C. Samples for Initial Selection: For the following:
   1. Color selector charts for each type of unit paver indicated.
   2. Joint materials involving color selection.

D. Samples for Verification:
   1. Full-size units of each type and color of unit paver indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store liquids in tightly closed containers protected from freezing.

1.06 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Mortar and Grout:
   1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
      a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS

2.01 CONCRETE PAVERS

A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.
   1. Manufacturers: Subject to compliance with requirements, provide products by Hanover Architectural Products, or approved equal.
   2. Type CP1:
      a. Style: Traditional Prest Brick with Natural Finish.
      b. Thickness: 3 inches.
      c. Face Size and Shape: 4” x 8” rectangle.
      d. Finish: Natural finish.
      e. Colors: As indicated in Drawings.
      f. Patterns: As indicated in drawings.
   3. Type CP2:
      a. Style: Traditional Prest Brick with Natural Finish.
      b. Thickness: 3 inches.
      c. Face Size and Shape: 4” x 8” rectangle.
      d. Finish: Natural finish.
      e. Colors: As indicated in Drawings.
      f. Patterns: As indicated in drawings.

B. ADA Detectable Surface Pavers: Provide truncated dome detectable surface precast concrete pavers at curb ramps as indicated in Drawings and where required at curb ramps by authorities having jurisdiction. Pavers as manufactured by Hanover Architectural Products, or equal.
   1. Size: Nominal 3"x4"x8"
   2. Color: Charcoal.

2.02 ACCESSORIES

A. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

B. Geo-textile: Provide geo-textile as indicated in drawings and as recommended by paver manufacturer.

2.03 LEVELING COURSE

A. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

B. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
   1. Provide sand of color needed to produce required joint color.

2.04 MORTAR SETTING-BED MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II.

B. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.

C. Thinset Mortar: Latex-modified portland cement mortar complying with ANSI A118.4.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Custom Building Products.
      b. Jamo Inc.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. Mer-Krete System, ParexLahabra, Inc.
      f. ProSpec.
      g. Southern Grouts & Mortars, Inc.
      h. Summitville Tiles, Inc.
      i. TEC, Specialty Construction Brands, Inc.

D. Water: Potable.

2.05 GROUT MATERIALS

A. Standard Cement Grout: ANSI A118.6, sanded.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Custom Building Products.
      b. Jamo Inc.
      c. Laticrete International, Inc.
      d. MAPEI Corporation.
      e. Mer-Krete System, ParexLahabra, Inc.
      f. ProSpec.
      g. Southern Grouts & Mortars, Inc.
      h. Summitville Tiles, Inc.
      i. TEC, Specialty Construction Brands, Inc.

B. Grout Colors: As selected by Architect from manufacturer's full range.

C. Water: Potable.

2.06 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

B. Mortar-Bed Bond Coat: Mix neat cement and latex additive to a creamy consistency.

C. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

D. Thinset Mortar Bond Coat: Proportion and mix thinset mortar ingredients according to manufacturer's written instructions.

E. Job-Mixed Portland Cement Grout: Proportion and mix job-mixed portland cement and aggregate grout to match setting-bed mortar except omit hydrated lime and use enough water to produce a pourable mixture.
   1. Colored-Aggregate Grout: Produce color required by combining colored aggregates with portland cement of selected color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas indicated to receive paving, 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.

3.02 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.03 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
   1. For concrete pavers, a block splitter may be used.

D. Joint Pattern: As indicated.

E. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants."

G. [Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers. Paver steps installed using mortar setting bed method unless otherwise indicated].

3.04 SAND SETTING-BED OVER CONCRETE APPLICATIONS

A. Install paver edge restraint angles per manfuacturer's written instructions. Install edge restraint angles at all edges of pavers that are not otherwise restrained by concrete curbs or similar construction.

B. Place leveling course and screed to a thickness of 1-1/2 to 2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

C. Treat leveling course with herbicide to inhibit growth of grass and weeds.

D. Set pavers to specified tolerances. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
   1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
   2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
   3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
   4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.

E. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

F. Do not allow traffic on installed pavers until sand has been vibrated into joints.

G. Repeat joint-filling process 30 days later if joints show evidence of settling or of joints that are not completely filled.

3.05 MORTAR SETTING-BED APPLICATIONS

A. Saturate concrete sub-base with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply mortar-bed bond coat over surface of concrete sub-base about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.

C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.

E. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch thick bond coat to mortar bed or to back of each paver with a flat trowel.

F. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

G. Spaced Joint Widths: Provide 3/8-inch.

H. Grouted Joints: Grout paver joints complying with ANSI A108.10.

I. Grout joints as soon as possible after initial set of setting bed.
   1. Force grout into joints, taking care not to smear grout on adjoining surfaces.
   2. Clean pavers as grouting progresses by dry brushing or rubbing with dry burlap to remove smears before tooling joints.

3. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
4. If tooling squeezes grout from joints, remove excess grout and smears by dry brushing or rubbing with dry burlap and tool joints again to produce a uniform appearance.

J. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.

3.06 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

END OF SECTION 32 14 00

SECTION 32 17 00 - PAVEMENT SPECIALTIES

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. Section Includes:
   1. Parking barriers.
   2. Striping & directional paint markings.
   3. Precast Concrete Bollard Caps for Steel Pipe Bollards.

B. Related Sections include the following:
   1. Division 03 Section- "Concrete".
   2. Division 32 Section - "Paving".
   3. Division 32 Section - "Unit Paving".

1.03 GENERAL

A. Furnish all labor, materials, services, equipment and appliances required for pavement specialty work indicated on the drawings and specified herein.

1.04 JOB CONDITIONS:

A. Condition of pavement: Clean, dry and cured minimum amount of time as recommended by striping paint manufacturer.

1.05 SUBMITTALS

A. Submit manufacturer's literature to the Architect for approval. Literature shall show compatibility of product proposed for use with paving surface to which product is to be applied.

B. Samples for initial selection: Manufacturer's standard selector samples or printed material showing accurate color rendition, for warning mats and concrete bollards.

1.06 COORDINATION OF WORK

A. Contractor and subcontractor for work of this section shall be jointly responsible for the coordination of the work specified herein, including but not limited to:
   1. Fire Lanes: Coordinate with all governing authorities to determine exact requirements (whether or not shown on the drawings). Fire lane marking, if required, is part of the work of the base contract.
   2. Handicapped Parking Spaces: Coordinate with all governing authorities to determine exact requirements (whether or not shown on the drawings). Special marking, if required, is part of the work of the base contract.
   3. Colors: Coordinate color requirements with all governing authorities, use only acceptable colors. Colors specified herein shall be used, if acceptable.
   4. Notification: Notify the Owner of any required variation from the drawings resulting from coordination.

1.07 PROTECTION

A. Protect newly painted surfaces from damage by vehicles during the time required for paint to harden sufficiently to withstand traffic. Any damage to newly painted markings due to the paint subcontractor's failure to provide adequate protection shall be repaired by him at no additional cost to the Owner.

1.08 GUARANTEE

A. Pavement Markings:
   1. Any work found to be defective due to poor workmanship or defective materials within a 60-day evaluation period from Substantial Completion will immediately be replaced at no additional cost to the Owner. A new 60-day evaluation period will commence upon repair. Contractors One-Year corrective period shall also be enforced as a remedy by Owner for continued deteriorating paint installation.
   2. Indications of defective work for the purpose of this guarantee include poor adhesion to the pavement surfaces, checking, cracking, peeling and discoloration. This shall not be construed to include wear, damage or discoloration caused by traffic, erosion or from normal exposure to the elements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Parking Barriers: Precast concrete, semicircular or beveled square in cross-section 6" high x 8" wide x 6'-0" long with holes for minimum anchoring dowels. In van accessible spaces, size shall be 6” high x 8” wide x 8’-0” long.

B. Pre-Cast Concrete Bollard Caps: Pre-cast concrete bollard caps with anchors equal to TopGard "Pipe Bollard Caps". Size(s) to match steel pipe bollard sizes indicated. Provide at all new bollards unless otherwise noted

C. Striping & Directional Marking Paint: Acrylic parking lot and/or street marking paint, recommended by manufacturer for type of surface.
   1. Paint type: Acrylic, water-borne pavement marking paint conforming to Texas Dept. of Highways Special Specification Traffic paint.
   2. Color:
      a. General Use Striping, Directional Marking, & H.C. Marking: Manufacturer's standard flat white.
      b. At line striping in drive aisles that is located between opposite directions of traffic, use traffic yellow.
      c. Fire Lane Striping: Manufacturer's standard red or as per city code. Fire lane striping shall have lettering stenciled in white at 40' intervals, to read: “NO PARKING-FIRE LANE”, or as required by local fire codes and regulatory authorities.

PART 3 - EXECUTION

3.01 PREPARATION

A. New concrete surfaces will be allowed to cure for a period of not less than 11 days before application of marking materials.

B. Dust, clay, silt and excess sand will be removed (by sweeping) from the pavement to be marked before application of paint.

C. Prior to beginning work, confirm requirements of regulatory authorities for pavement markings including colors. Where TxDOT or other authority has jurisdiction, confirm their

requirements. Locate the fire lane striping on horizontal paving surface or on entire concrete curbs as required by local authorities. Where fire lanes are painted in a radiused arc across drive aisle, confirm acceptable radius dimension with local authorities for fire lane striping.

3.02 INSTALLATION:

A. Equipment: Spray mechanism capable of applying paint at the rate specified at an even and uniform thickness, with clear cut edges. Mechanism shall be operated by means of quick opening and closing valves conveniently located.

B. Striping & Marking:
   1. Where pavement is trowel or wood float finish concrete, lightly sandblast immediate area to receive striping prior to application of paint.
      a. Rough broom finish areas will not require sand-blasting.
   2. Apply paint in accord with manufacturer's written instructions. Apply at a rate of one gallon spread evenly over an area of 105 SF± five square feet and a wet film thickness of 0.015 inch (15 mils.).
   3. Paint 4" wide lines in patterns and spacing as shown on drawings. Width of the lines shall be within a tolerance of one-half inch. The centerline of marking shall not deviate more than one-half inch laterally from a straight line at any point.
   4. Parking Striping:
      a. Painted lines: 4" wide, generally 20' long, and spaced approximately 9' O.C. except where noted or local authorities require otherwise.
      b. If the overall space divides equally into slightly larger spacing than 9', individual spaces should be increased equally, but should not in any case be less than 9' O.C., unless noted otherwise on drawings.

C. Parking Barrier: Drill hole through pavement surface for steel rods to secure barrier in place. Barrier shall be centered between paint stripes. Minimum 2 #5 rods per barrier extended below paving surface and countersink 1/2" below top surface of barrier. At asphalt paving, extend 24" below paving.

D. Pre-Cast Concrete Bollard Caps for Pipe Bollards: Install according to Manufacturer's installation instructions.

3.03 CLEANING

A. Any spilled paints shall be cleaned from the paved areas to the satisfaction of the Owner. Keep the premises clean at all times.

B. Paint, empty containers, and other materials or equipment shall not be stored or allowed to accumulate on, or near the paved areas.

C. Upon completion of work of this section remove related debris from premises.

END OF SECTION 32 17 00

SECTION 32 31 29 – WOOD AND COMPOSITE FENCING

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. Section Includes:
   1. Extent of fence work is indicated on drawings.

B. Related Sections include the following:
   1. Division 05 Section - Metal Fabrications for gate frames and hardware.
   2. Division 32 Section - Concrete Paving

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data, and installation instructions for wood or composite fencing.

PART 2 - PRODUCTS

2.01 GENERAL

A. Dimensions indicated for pipe are outside dimensions.

2.02 COMPOSITE FENCING (BASE BID)

A. Line Posts: 4” x 4” galvanized steel tube with welded post cap, spaced at 5’-6” O.C. maximum.

B. Terminal Posts: 4” x 4” galvanized steel tube with welded post cap.

C. Gate Posts: 6” x 6” galvanized steel tube with welded post cap.

D. Slats: Select Composite Decking by Trex Company, Inc., 1” x 8” x 12’ fascia, installed in running bond pattern. Color to be selected by Architect.

E. Fasteners: Galvanized steel carriage through-bolts in locations as indicated on drawings. Nuts and washers on interior side of fence.

F. Gates and Hardware: Refer to Division 05 Section “Metal Fabrications”.

2.03 WOOD FENCING (ALTERNATE 5)

A. Line Posts: 2" diameter posts for supporting frame at 8' O.C. maximum.

B. Terminal Posts: 2-1/2" diameter galvanized pipe.

C. Gate Posts: 6” x 6” galvanized steel tube with welded post cap.

D. Post Tops: Provide weather-tight galvanized closure cap; one cap for each post.

E. Pickets: 1" x 6" x 7’-6” cedar

F. Rails: 2" x 4" cedar

G. Post Brackets: Galvanized steel strap

H. Gates and Hardware: Refer to Division 05 Section “Metal Fabrications”.

PART 3 - EXECUTION

3.01 WOOD FENCING INSTALLATION

A. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

B. Fasteners: Install nuts for post brackets and hardware bolts on side of fence opposite wood fencing. Peen ends of bolts or score threads to prevent removal of nuts.

C. Attach wood pickets to rails using galvanized nails at 6 nails per picket. Align top of picket row to be parallel to grade. No gaps between pickets will be allowed. Bottom gap not to exceed 3" from grade.

END OF SECTION 32 31 29

SECTION 32 84 00 - PLANTING IRRIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Piping.
   2. Encasement for piping.
   3. Manual valves.
   4. Pressure-reducing valves.
   5. Automatic control valves.
   6. Automatic drain valves.
   7. Transition fittings.
   8. Dielectric fittings.
   9. Miscellaneous piping specialties.
   10. Sprinklers.
   11. Quick couplers.
   12. Drip irrigation specialties.
   13. Controllers.
   14. Boxes for automatic control valves.

1.03 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

E. Irrigation Mains: That portion of piping from water source to remote control valves. This portion of piping is subject to surges, being a closed portion of irrigation system. Hydrant lines (QCV) are considered part of main line piping system.

F. Lateral Piping: That portion of piping from remote control valve to sprinkler heads.

1.04 DELEGATED DESIGN

A. Engage a licensed irrigation engineer to design and permit a complete irrigation system in compliance with these specifications, and in compliance with requirements of authorities having jurisdiction.
   1. Make adjustments in field as necessary to avoid plantings and other obstructions.

B. Coordination: Prepare design and coordinate installation of required sleeves with other trades as required, prior to paving work. Where existing paving to remain is in the path of irrigation lines, include boring as required to install new irrigation system, unless otherwise noted in Drawings.

C. Design Criteria, General: Contractor shall design an automatic irrigation system to provide adequate irrigation to sustain planting shown in the Landscaping plans, including landscape beds and trees.
   1. Delegated design engineer is responsible to determine existing water pressure and design system to work with available pressure, and to design and performance requirements. Indicate design pressure and static pressure on irrigation plans.
   2. All new trees shall receive bubbler irrigation, whether or not included in the outline of the zone to be irrigated as shown in the Landscape Drawings.
   3. Provide drip irrigation at landscaping beds.
   4. Provide spray heads at small turf areas.
   5. Provide rotor heads at large turf areas.

D. System Design requirements:
   1. Strictly adhere to all TCEQ rules and regulations.
   2. Velocities shall not exceed 5 F.P.S. Irrigation plan to show velocities for all piping.
   3. System shall be capable of applying .33 inches of water during one watering cycle, between 11:00 pm - 6:00 am. All zones must operate during one watering cycle.
   4. All valves shall be in plastic valve boxes no smaller than 10" for single control valves, or nominal 12" x 17" for other valves. Box shall be adequately sized to provide service access for all valves in all cases.
   5. Lateral lines to have minimum 12 inch coverage. Main lines to have minimum 18 inch coverage.
   6. Provide flex pipe (12 inch minimum length) with barbed fittings for all pop up spray heads.
   7. Provide three ell swing joints for all turf type rotor heads.
   8. Indicate design pressure and static pressure on plans.
   9. Install heads minimum 4 inches from any hard surface.
   10. Provide tree irrigation, drip irrigation for planters, landscaping areas drip irrigation, shrub heads and landscape bed spray irrigation, and turf area spray irrigation, on separate zones from each other.
   11. All utilities under hard (paved) surfaces shall be sleeved.
   12. Sleeves shall be large enough for wire and pipe as required and extend 6 inches beyond hard surface.
   13. Irrigation design must account for minimum drift and reduction of water on street and paved surfaces.
   14. Where possible, micro irrigation may be utilized.

15. System to provide complete coverage at all landscape bed areas.
16. Consider all plant heights and grade changes in design and installation of the irrigation system.
17. Turf and unlike plant materials shall be zoned separately based on water needs.
18. Provide 100 percent coverage by locating heads as recommended by the manufacturer. Proper overlap shall prevent “scalloping”. No throw is permitted over walks, drives or buildings.
19. System to provide quick couplers at maximum of 100' intervals.
20. System to be designed with expansion capability to accommodate future expansion zones for future construction of (3) replacement out-buildings and associated landscaping, and as indicated in the Drawings. Provide total of twelve spare wires, evenly divided among the end points designated in the Drawings. Extend minimum size of 1-1/2" main line with capped end to each of these locations. Provide a 10" box at each future expansion termination point.
21. Thrust blocks and concrete valve boxes may be required by Authorities having jurisdiction. Contractor shall coordinate.
22. System design must be approved by Architect prior to permitting, and by Authorities having jurisdiction before installation.
23. Provide system design and layout of heads and emitters by Irrigation Engineer licensed in the State of Texas. Make adjustments in field as necessary to avoid plantings and other obstructions.

E. Temporary Irrigation: If temporary irrigation is utilized to establish grass or landscaping, it must meet the following guidelines:
1. Landscape beds and ground cover areas to be zoned separately from tree irrigation and turf irrigation.
2. Heads in lawn areas shall be offset 4 inches from back of curb and have flat trajectory.
3. Heads in bed areas are to be 2" from hard surface, and be pop-up type.
4. Compliant with any other requirements of local authorities to minimize water on paving surfaces.

1.05 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
1. Irrigation Main Piping: 260 psi.
2. Circuit Piping: 150 psi.

1.06 QUALITY ASSURANCE

A. Installer and Designer Qualifications: Licensed and approved as required by local authorities having jurisdiction. Installer with minimum 5 years continuous operation installing irrigation systems of comparable scale and complexity, under the current company and name.

B. Ordinances, Codes and Regulations: All local, municipal and state laws, rules and regulations governing any portion of this work are hereby incorporated into and made a part of these specifications. Their provisions shall be carried out by the Contractor.

Requirements of these specifications shall not be construed to conflict with any of these rules, regulations, or requirements of the same.

1. When these specifications and drawings require materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, these specifications and drawings shall take precedence

C. Permits and Fees: The Contractor shall obtain and pay for any and all permits and all observations as required by authorities having jurisdiction.

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. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

1.07 REFERENCES

A. ASTM - American Society for Testing Materials
   1. D2241: Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
   2. D2287: Flexible Polyvinyl Chloride (PVC).
   3. D2464: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 80.
   4. D2466: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
   5. D2564: Solvent Cement for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.
   6. D2855: Making Solvent - Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.

1.08 SUBMITTALS

A. Division 01: Section - Submittal Procedures

B. Product Data: Manufacturer's product data with installation and storage instructions for each product specified.
   1. Shop Drawings:
      a. Indicate location of irrigation heads to match specified water coverage. Indicate valves, piping and accessories, show design pressure, valve size, pipe size, GMP requirements, drain valves, and sleeves.
      b. Show location and size of city/county main, size of tap to be made, water meter location, and backflow prevention size and location.

C. Division 1: Section – Closeout Procedures
   1. Operating and Maintenance Instructions: Provide two copies of instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer’s parts catalog.
      a. Include winterization procedures.

b. Indicate length of time each valve is to be open to produce a given amount of water delivery.

2. Record drawings:
   a. Indicate locations, sizes and kinds of equipment installed.
   b. Dimension from 2 permanent points of reference (building corners, sidewalk, or road intersections, etc.) the location of the following items:
      1) Connection to water lines.
      2) Connection to electrical power.
      3) Gate valves.
      4) Routing of sprinkler pressure lines (dimension max. 100' along routing).
      5) Significant changes in routing of lateral lines form those indicated on Drawings.
      6) Sprinkler control valve.
      7) Routing of control wiring.
      8) Yard hydrants and quick coupling valves.
3. Controller Charts:
   a. Record Drawings shall be approved by the Contracting Officer before controller charts are prepared.
   b. Submit 2 controller charts for each controller.
   c. Show the area controlled by the automatic controller. It shall be the maximum size which the controller enclosure door will allow.
   d. The chart shall be a reduced drawing of the actual as-built system If controller sequence is not legible when the drawing is reduced, enlarge to size that will be readable when reduced.
   e. Chart shall be a blackline or blueline ozalid print. Use a different color to indicate the area of coverage for each station.
   f. When approved, hermetically seal chart between 2 pieces of plastic and securely mount to controller enclosure door.

1.09 PROJECT / SITE CONDITIONS

A. Existing Utilities: Be responsible for locating and identifying existing utilities. Notify Architect of any conflicts which affect the approved irrigation layout.

B. Obstructions Below Grade: If obstructions such as rock or underground construction work are encountered in any irrigation excavation work, alternate locations will be selected. Where locations cannot be changed, removed obstruction. The obstruction shall be removed to a depth of not less than 3 feet below grade.

C. Damage by Leaks: Be responsible for damage to the grounds, plants, walks, roads, building piping system, electrical systems, and their equipment and contents cause by leaks in piping systems being installed or having been installed. Repair damages so caused at no additional cost to the Owner.

D. Staking: Be responsible for location staking. Irrigation head locations shall be determined by calculating dimensions from approved shop drawings. Adjustments may be necessary to avoid interference with underground obstructions.

1.10 WARRANTY

A. Repair any settling of backfilled trenches which may occur during the warranty period.

B. Restore all damaged plantings, paving, or improvement within the warranty period.

C. Materials and equipment shall be warranted in writing against defects in materials and workmanship by the respective manufacturers. All installation work shall be guaranteed for two years after final acceptance.

D. No claims under warranty shall be considered for materials damaged or destroyed by vandals or damages caused by unauthorized operations of the system.

1.11 MAINTENANCE TOOLS

A. Provide 2 sets of tools for removing, disassembling and adjusting each type of sprinkler head and valve supplied.

B. Provide three quick coupling keys and three ¾ inch hose swivels as part of this contract.

C. Provide 2 five foot keys for operation of gate valves.

D. Provide 2 keys for each automatic controller.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Heads, valves, controllers, backflow preventers, yard hydrants and other components as scheduled on shop drawings.

B. Pressure Mainlines and Non-Pressure Lateral Lines: All pipe, in sizes indicated on the shop drawings shall be marked continuously and permanently with the following information: Manufacturer's name, nominal pipe size, class or schedule, and NSF approval, and type of pipe.

2.02 PIPE AND PIPE FITTINGS

A. Irrigation Mains:
   1. Pipe: ASTM D 1784, PVC Schedule 40, SDR-21, 260 psi maximum.
   2. Joint: ASTM D 2241 bell end type
   3. Fittings: Schedule 40, ASTM D 2466 solvent cement type.

B. Zone Lateral Lines:
   1. Pipe: ASTM D 1784, PVC Class-200, SDR-21.
   2. Joints: ASTM D 2241 bell end.

3. Fittings: ASTM D2 466 Socket type.

C. Gate Valves:
   1. 3" and larger: Iron body, non-rising stem, threaded ends.
   2. 2-1/2" and smaller: Type 1, class 150 psi, threaded ends.

D. Station Control Valves:
   1. Station Control Valves: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following.
      a. "PEB Series" – Rain Bird Sales, Inc., Glendora, CA (818) 963-9311.
   2. Valve Type: Remote control valves. Substitutions: Permitted.
   3. Primers and Solvents: As recommended by PVC pipe manufacturer.

2.03 SPRINKLER HEADS

A. Small Area Heads (for use in small lawn/shrub areas):
   1. Small Aread Heads: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following:
      a. Cycolac (plastic) "1800 Series" – Rain Bird Sales, Inc., Glendora, CA (818) 963-9311.
   2. Each head shall have an interchangeable nozzle (available in different patterns and distances of throw). Substitutions: Permitted.
   3. Each head shall have a basket screen.
   4. Provide pressure compensating screens (P.C.S) as indicated on Drawings.

B. Large Area Heads (for use in large lawn areas)
   1. Large Area Heads: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following.
      a. 3500 Series – Rain Bird Sales, Inc., Glendora, CA (818) 963-9311.
   2. Use adjustable arc (ADJ) unless Drawings show full circle (360) Substitutions: Permitted.
   3. If water pressure is excessively high, provide pressure reducing feature on zone valves.

2.04 AUTOMATIC CONTROL SYSTEM

A. Automatic Controllers: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following.
   1. Manufacturer: ESP-20 – MC Plus – Rain Bird Sales, Inc., Glendora, CA (818) 963-9311.
      a. LPP-K Primary Surge Protector
      b. LK-712 (Lock) Provide Owner with two keys.

B. Division 1: Section – Product Requirements.

C. Substitutions: Permitted.

D. Stations: Control stations as shown on shop drawings.

E. Station Timing: Independent for each station with each infinitely adjustable from 0 to 60 minutes.

F. Day Programming: Programming dials encompassing 14-day cycle.

G. Operation: Capable of automatic or manual function as selected by operator.

H. Power Requirements:
   1. Input: 115 volt AC
   2. Output to Valves: 24 Volts AC.

I. Provide reset circuit breaker for overcurrent protection.

J. Provide master manual on-off switch.

K. Rain Detector:
   1. Rain Detector: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following.
      a. "Mini-Clik" by Glen-Hilton Products, Inc., Bethesda, MD, (301) 441-8673.
   2. Division 1: Section – Product Requirements.
   3. Substitutions: Permitted.
   4. Follow manufacturer's recommendations for mounting and confirm location with Owner and Architect.

2.05 VALVE BOX

A. Valve Boxes: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following.
   1. Ametek, Plymouth Products Division, Sheboygan, WI (414) 457-9435, Superflexon Valve Box "No.10-170-001" with cover No. "10-173-004", with pentagon (1) locking device.

B. Division 01: Section – Product Requirements. Substitutions permitted.

C. Paint box covers matte black with paint specified in Section 099000 – Painting.

2.06 SWING JOINTS

A. Swing joints are to be made of Schedule 40 pipe with insert to male thread combination elbows. The swing joint will allow for precise adjustments of each head to grade as well as protecting both the head and the pipe from damage if struck by unusual force.

2.07 CONTROL WIRE

A. Control Wire: All wire shall be #14 AWG solid copper, single conductor, rated U.F. with U.L listing, with 600 volt PVC insulation. All splices shall be made with wire nuts and totally encased in DBY direct burial splice kits.

2.08 QUICK COUPLING VALVES

A. Quick Coupling Valves: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following:
   1. Rain Bird "3RC"

B. Mount quick coupling valves on ¾ inch galvanized triple swing joints. All swing joints are to be assembled using two to three wraps of Teflon tape.

2.09 DRIP IRRIGATION

A. Summary
   1. This Section includes the installation of low volume irrigation components including Control Zone Kits, Landscape Dripline, Fittings and Emission Devices.

B. Drip Irrigation Products
   1. Control Zone Kits
      a. General
         1) Control zone kit assemblies for drip irrigation zones must include a valve, filtration and pressure regulation to meet the flow requirements of the zone. Where necessary a check valve shall also be installed.
         2) Control zone kits shall be Rain Bird control zone kits as indicated on construction drawings.
         3) Components shall be sized according to the hydraulic demands of the system.
      b. Pressure Regulation Filters
         1) Low Flow Control Zone Kit for zones with flows from 0.2 to 5.0 GPM (1 to 19 l/m)
            a) Control zone kits shall be Rain Bird Control Zone Kits with a Rain Bird Pressure Regulating (PR) Filter.
            b) The Pressure Regulating Filter combines filtration and pressure regulation in one unit for protection of downstream components of a drip irrigation system. The pressure regulator is integrated into the filter body. The unit contains both a 200 mesh (75 micron) filter and a pressure regulator. The PR Filter shall have a body and cap that are made of glass-filled, UV-resistant polypropylene, with 120 psi (8,3 bars) pressure rating. The pressure regulating device is a normally open device that allows full flow with little pressure loss unless the inlet pressure is greater than the preset level. As the inlet pressure increases above the preset level it compresses a spring and begins to reduce the downstream pressure. The

pressure regulator built into the PR Filter body shall have a preset outlet pressure of approximately 30 psi (2,1 bars). The filter screen shall be constructed of durable polyester fabric attached to propylene frame. The standard 200-mesh screen (75 micron) shall be serviceable for cleaning purposes by unscrewing the cap from the body and removing the filter element. The design shall be of a compact "Y" body and cap configuration. The 3/4" filter body shall have a 3/4" male threaded inlet and outlet. The dimension for the PR filter shall not exceed the following: Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm).

c) The control zone kits shall have an automatic irrigation control valve that is Rain Bird's Low Flow Valve or Low Flow Anti-Siphon Valve.

d) The Rain Bird Low Flow Valve shall have a diaphragm with a double-knife seal and constructed of durable Buna-N rubber with a clog-resistant metering orifice. The valve shall have one 90-mesh (200 micron) filter attached to the solenoid base. The valve shall have a ½" diameter seat. The valve body and bonnet shall be constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials.

e) Control zone kits with the Low Flow Anti-Siphon Valve shall have all the specifications of the Rain Bird control zone kits except that it shall include as one unit an electric irrigation control valve and atmospheric backflow preventer with an IAPMO approved listing.

f) Models:

(1) Low Flow Kit with Low Flow Valve and Pressure Regulating Filter with 200 mesh (75 micron) screen

(a) XCZ-075-PRF (¾" Low Flow Valve and ¾" PR Filter)

(b) XCZ-LF-100-PRF (1" Low Flow Valve and ¾" PR Filter)

(2) Low Flow Kit with Low Flow Anti-Siphon Valve and Pressure Regulating Filter with 200 mesh (75 micron) screen

(a) XACZ-075-PRF

2) Medium Flow Control Zone Kit for zones with flows from 3 to 15 GPM (11–58 l/s)

a) Control zone kits shall be Rain Bird Control Zone Kits with a Rain Bird Pressure Regulating (PR) Filter.

b) The Pressure Regulating Filter combines filtration and pressure regulation in one unit for protection of downstream components of a drip irrigation system. The pressure regulator is integrated into the filter body. The unit contains both a 200 mesh (75 micron) filter and a pressure regulator. The PR Filter shall have a body and cap that are made of glass-filled, UV-resistant polypropylene, with 120 psi (8,3 bars) pressure rating. The pressure regulating device is a normally open de-

vice that allows full flow with little pressure loss unless the inlet pressure is greater than the preset level. As the inlet pressure increases above the preset level it compresses a spring and begins to reduce the downstream pressure. The pressure regulator built into the PR Filter body shall have a preset outlet pressure of approximately 40 psi (2,8 bars). The filter screen shall be constructed of durable polyester fabric attached to propylene frame. The standard 200-mesh screen (75 micron) shall be serviceable for cleaning purposes by unscrewing the cap from the body and removing the filter element. The design shall be of a compact "Y" body and cap configuration. The 1" filter body shall have a 1" male threaded inlet and outlet. The dimension for the PR filter shall not exceed the following: Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm).

c) The control zone kits shall have an automatic irrigation control valve that is Rain Bird's DV Valve or anti-siphon ASV Valve.

d) The Rain Bird DV Valve or ASV valve shall have a diaphragm that is constructed of durable Buna-N rubber with a clog-resistant metering orifice. The valve shall have one 90-mesh (200 micron) filter attached to the solenoid base. The valve body and bonnet shall be constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials.

e) Control zone kits with the Anti-Siphon ASV Valve shall have all the specifications of the Rain Bird control zone kit except that it shall include as one unit an electric irrigation control valve and atmospheric backflow preventer with an IAPMO approved listing.

f) Models

(1) Medium Flow Kit with DV Valve and Pressure Regulating Filter with 200 mesh (75 micron) screen

(a) XCZ-100-PRF

(2) Medium Flow Kit with Anti-Siphon Valve and Pressure Regulating Filter with 200 mesh (75 micron) screen

(a) XACZ-100-PRF

c. Pressure Regulating Back Flush Filters

1) Low Flow Control Zone Kits for zones with flows from 0.2 to 5 GPM (1-19 l/m).

a) Control zone kits shall be Rain Bird Control Zone Kits with a Rain Bird Pressure Regulating (PR) Back Flush Filter.

b) The PR Back Flush Filter combines filtration with automatic cleaning and pressure regulation in one unit for protection of downstream components of a drip irrigation system. The pressure regulator is integrated into the filter body. The PR Back Flush Filter body shall be constructed of heavy-duty, glass-filled, UV resistant plastic material providing a pressure rating of not less than 120 psi (8,3 bars). The filter element shall be constructed of durable polyester fabric attached

to a propylene frame. Automatic cleaning shall take place through a moving piston scouring the filter element each time the irrigation system is pressurized and de-pressurized. The 200-mesh screen (75 micron) shall be serviceable for manual cleaning purposes by unscrewing the cap from the body and removing the filter element. The PR Back Flush Filter shall come with a rubber Duck Bill Boot that is attached over the cap to prevent bugs and debris from entering the cleaning ports of the cap. The design shall be of a compact "Y" body and cap configuration. The ¾ filter body shall have a ¾" male threaded inlet and outlet. The dimension for the filter shall not exceed the following: Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm).

c) The Pressure Regulating Back Flush Filter shall have an integrated pressure regulator that has an inlet pressures rating of not less than 120 psi (8,3 bars). The pressure regulating device is a normally open device that allows full flow with little pressure loss unless the inlet pressure is greater than the preset level. As the inlet pressure increases above the preset level it compresses a spring and begins to reduce the downstream pressure. The inline pressure regulator shall have a preset outlet pressure of approximately 30 psi (2,0 bar).

d) When the control zone kit is not installed at the highest point of the irrigation zone it serves, a check valve shall be installed downstream of the PR Back Flush Filter to prevent water from draining back into the valve box.

e) Valves for these kits shall be either Rain Bird's Low Flow Valve or Low Flow Anti-Siphon Valve where backflow prevention is needed.

f) The Rain Bird Low Flow Valve shall have a diaphragm with a double-knife seal and constructed of durable Buna-N rubber with a clog-resistant metering orifice. The valve shall have one 90-mesh (200 micron) filter attached to the solenoid base. The valve shall have a ½" diameter seat. The valve body and bonnet shall be constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials.

g) Control zone kits with the Low Flow ASV Valve shall have all the specifications of the Rain Bird control zone kits with the Pressure Regulating Back Flush Filter except that it shall include as one unit an electric irrigation control valve and atmospheric backflow preventer with an IAPMO approved listing.

h) Models:

(1) Low Flow Kits with ¾" Low Flow Valve, Pressure Regulating Back Flush Filter with 200-mesh (75 micron) screen.

(a) XCZ-075-PRF-BF

(2) Low Flow Kits with ¾" Low Flow Anti-Siphon Valve, Pressure Regulating Back Flush Filter with 200-mesh (75 micron) screen.
(a) XACZ-075-PRF-BF
(3) Optional Check Valve: CV-075

2) Medium Flow Control zone kit for zones with flows from 3 - 15 GPM(11-58 l/m).
a) Control zone kits shall be Rain Bird Control Zone Kits with a Rain Bird Pressure Regulating (PR) Back Flush Filter.
b) The PR Back Flush Filter combines filtration with automatic cleaning and pressure regulation in one unit for protection of downstream components of a drip irrigation system. The pressure regulator is integrated into the filter body. The Pressure Regulating Back Flush Filter body shall be constructed of heavy-duty, glass-filled, UV resistant plastic material providing a pressure rating of not less than 120 psi (8,3 bars). The filter element shall be constructed of durable polyester fabric attached to a propylene frame. Automatic cleaning shall take place through a moving piston scouring the filter element each time the irrigation system is pressurized and depressurized. The 200-mesh screen (75 micron) shall be serviceable for manual cleaning purposes by unscrewing the cap from the body and removing the filter element. The Pressure Regulating Back Flush Filter shall come with a rubber Duck Bill Boot that is attached over the cap to prevent bugs and debris from entering the cleaning ports of the cap. The design shall be of a compact "Y" body and cap configuration. The 1" filter body shall have a 1" male threaded inlet and outlet. The dimensions for the filter shall not exceed the following: Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm).
c) The Pressure Regulating Back Flush Filter shall have an integrated pressure regulator that has an inlet pressure rating of not less than 120 psi (8,3 bars). The pressure regulating device is a normally open device that allows full flow with little pressure loss unless the inlet pressure is greater than the preset level. As the inlet pressure increases above the preset level it compresses a spring and begins to reduce the flow and downstream pressure. The inline pressure regulator shall have a preset outlet pressure of approximately 40 psi (2,8 bar).
d) When the control zone kit is not installed at the highest point of the irrigation zone it serves, a check valve shall be installed downstream of the PR Back Flush Filter to prevent water from draining back into the valve box.
e) The control zone kits shall have an automatic irrigation control valve that is Rain Bird's DV Valve or anti-siphon ASV Valve.
f) The Rain Bird DV Valve or ASV valve shall have a diaphragm that is constructed of durable Buna-N rubber with a

clog-resistant metering orifice. The valve shall have one 90-mesh (200 micron) filter attached to the solenoid base. The valve body and bonnet shall be constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials.

g) Control zone kits with the Anti-Siphon Valve shall have all the specifications of the Rain Bird control zone kits except that it shall include as one unit an electric irrigation control valve and atmospheric backflow preventer with an IAPMO approved listing.

h) Models

(1) Medium Flow Kit with 1" DV Valve, Pressure Regulating self-cleaning Back Flush Filter with 200-mesh (75 micron) screen.

(a) XCZ-100-PRF-BF

(2) Medium Flow Kit with 1" ASVF Valve, Pressure Regulating self-cleaning Back Flush Filter with 200-mesh (75 micron) screen.

(a) XACZ-100-PRF-BF

(3) Optional Check Valve: CV-100

d. Basket Filter

1) Commercial Control Zone Kits for zones with flows from 3.0 to 40.0 GPM

a) Control Zone Kit shall be Rain Bird's Commercial Control Zone Kit with Rain Bird's 1" or 1 ½" PESB valve, Quick Check Basket Filter with 200-mesh (75 micron) screen and 40 psi Pressure Regulator.

b) The 1" control zone kit shall have a 1" isolation ball valve.

c) The filter shall be a 1" inline Quick Check Basket Filter body constructed of heavy-duty, glass-filled, UV resistant polypropylene capable of withstanding pressures of not less than 150 psi (10,3 bars). The design shall be a basket style body with jar-top cap. The cap shall incorporate an indicator that goes from green to red during operation when the filter element needs cleaning. The dimensions for the filter shall not exceed the following: Height: 6 1/2" (16,5 cm), Length: 6 ½" (16,5 cm), Width: 3 ½" (8,9 cm). The filter element shall be constructed of a durable stainless steel mesh attached to a propylene frame and shall be a standard 200-mesh (75 micron). The screen shall be serviceable for cleaning purposes by unscrewing the cap from the body and removing the filter element.

d) The control zone kit shall have an inline pressure regulator. The pressure regulator shall be constructed of durable, UV resistant non-corrosive material able to accommodate an inlet pressure rating of not less than 150 psi (10,3 bar). The pressure regulating device is a normally open device that allows full flow with little pressure loss unless the inlet pressure is greater than the preset level. As the inlet pressure increases above the preset level it compresses a spring and begins to

reduce the flow and downstream pressure. The inline pressure regulator shall have a preset outlet pressure of approximately 40 psi (2,8 bar).

e) The control zone kit shall have a 1" or 1 ½" Rain Bird PESB series automatic irrigation control valve. The valve pressure rating not to be less than 150 psi (10,3 bars). The valve body and bonnet shall be constructed of high-impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials. The valve shall have a diaphragm constructed of a durable Buna-N rubber material reinforced with nylon.

f) Models:

(1) Medium Flow Kit for 3.0 to 20.0 GPM (11 to 76 l/m). Includes a 1" PESB Valve, Basket Filter with 200 mesh (75 micron) screen, 40 psi Pressure Regulator and ball valve.

(a) XCZ-100-B-COM

(2) High Flow Kit for 15.0 to 40.0 GPM (58 to 151 l/m). Includes a 1 ½" PESB Valve, 1 ½" by 1" PVC TEE, Basket Filters (2) with 200 mesh (75 micron) screen, and 40 psi Pressure Regulators (2).

(a) XCZ-150-COM

2. Landscape Tubing

a. Black Stripe Tubing

1) Pressure-Compensating Rain Bird Black Stripe tubing

a) Rain Bird's Black Stripe tubing shall pressure compensate by lengthening the emitter's turbulent flow path. The emitter shall be cylindrical in shape and provide surface area for filtration throughout 360° of its outer circumference. This increased filtration surface area shall assure that the water that enters the inline emitter can always come from the upper half, or cleanest part of the flow path in the polyethylene tubing regardless of how the inline tubing lays on the ground.

b) Rain Bird Black Stripe tubing shall be black in color with vibrant green, purple, or yellow stripes for easy zone identification and conform to an outside diameter (O.D.) of 0.705 inches (16 mm) and an inside diameter (I.D.) of 0.615 inches.

c) Operating pressure range: 0 to 60 psi (0 to 4,1 bar).

d) Models to be Pressure-Compensating Landscape Black Stripe tubing for <u>potable</u> water systems:

(1) Rain Bird XBS Series with green, purple, and yellow striping.

b. 1/4" Distribution Tubing

1) Pressure – Compensating Rain Bird ¼" distribution tubing

a) Rain Bird ¼" distribution tubing shall be black in color and conform to an outside diameter (O. D.) of .220 inches and an inside diameter (I.D.) of .160 inches.

b) Distribution tubing shall fit over barbed outlet post on all xerigation devices and ¼" transfer fittings and shall be made from quality polyethylene of vinyl materials.

c) Models:

(1) Rain Bird Vinyl Tubing DT-025 Series coil of ¼" Vinyl Distribution Tubing
(2) Rain Bird Polyethylene Tubing PT-025 series coil of ¼" polyethylene tubing.

3. Fittings
   a. Compression Fittings
      1) Easy Fit Compression Fittings:
         a) The Easy Fit Compression Fitting System shall consist of 3 fittings (tee, coupling and elbow) plus 4 adapters and two removable flush caps.
         b) The Easy Fit Compression Fittings shall accept all polyethylene tubing from .630" to .710" (16mm-18mm) OD and shall provide a leak-free compression fit. They also shall provide connections to threaded components when used with any of the 5 adapters. The fittings shall be molded from UV-resistant ABS material with a Buna-N rubber seal for long-term, leak free connections.
         c) The adapters shall be made of UV-resistant ABS materials and shall only be used with Easy Fit Compression Fittings. The adapters shall be installed in the Easy Fit Compression Fittings and threaded onto ½" or ¾" Male- or Female-threaded components. Pressure loss for the Easy Fit Adapters is a maximum of .1 PSI for each adapter used.
         d) The removable black flush cap shall be used to close off a line. The purple flush cap shall be used to close off a line containing non-potable water.
         e) The operating pressure range for the Easy Fit Compression Fitting System shall be 0 to 60 psi (0 to 4,1 bars).
         f) Models:
            (1) Tee: MDCFTEE
            (2) Coupling: MDCFCOUP
            (3) Elbow: MDCFEL
            (4) Below Grade Irrigation Emission Stake: BIGIESTK
            (5) Adapters:
               (a) ½" Male pipe thread adapter: MDCF50MPT
               (b) ¾" Male pipe thread adapter: MDCF75MPT
               (c) ½" Female pipe thread adapter: MDCF50FPT
               (d) ¾" Female pipe thread adapter: MDCF75FPT
               (e) ¾" Female hose thread adapter: MDCF75FHT
            (6) Flush Cap end closure for potable system: MDCFCAP
      2) Compression Adapters
         a) Rain Bird compression adapters shall be made of ABS.
         b) The compression adapters shall be used to allow connection of PVC to polyethylene tubing.
         c) The 700 Series Compression adapter shall fit 1/2" polyethylene tubing with 0.700" O.D.
         d) The 600 Series Compression adapter shall fit Rain Bird Landscape Dripline and any 1/2" polyethylene tubing with 0.620"- 0.630" O.D.

e) The operating pressure range for the compression adapters shall be 0 to 50 psi (0 to 3,5 bars).
f) Models:
(1) 700-CF-1: 1/2" Compression Adapter
(2) 600-CF-1: 16mm Compression Adapter

b. LOC Fittings
1) The LOC fittings shall be used with any polyethylene tubing from 0.620 to .0630" OD (16 mm OD). The fittings shall connect and disconnect polyethylene tubing with a screw-on cap.
2) The LOC fittings shall be made from glass-filled polypropylene.
3) The operating pressure range for LOC fittings shall be 0 to 50 psi (0 to 3,5 bars).
4) Models:
a) LOC 16mm 050 MPT Adapter
b) LOC 16mm 075 MPT Adapter
c) LOC 16mm Tee
d) LOC 16mm Elbow
e) LOC 16mm Coupling

c. ¼" Barb Transfer Fittings
1) Rain Bird ¼" barb transfer fittings shall consist of 3 fittings: connector, elbow and tee.
2) Rain Bird ¼" barb transfer fittings shall be used to connect 1/4" distribution tubing (DT-025 or PT-025) with an ID of 0.16" (4 mm).
3) The transfer fittings shall be barbed on one end to permit easy insertion into any ½" or ¾" polyethylene tubing. They shall be able to be inserted into ½" or ¾" tubing by the use of the Xeriman® tool.
4) The ¼" barb transfer fittings shall be made from UV resistant acetyl.
5) The operating pressure range for the ¼" fittings shall be 0 to 50 psi (0 to 3,5 bars).
6) Models:
a) XBF1CONN: 1/4" Barb Connector
b) XBF2EL: 1/4" Barb x Barb Ell
c) XBF3TEE: 1/4" Barb x Barb x Barb Tee

4. Emission Devices
a. Point Source Single-Outlet Emission Devices
1) Rain Bird Xeri-Bug™ Emitters:
a) Rain Bird Xeri-Bug emitters shall be pressure-compensating over the pressure range of 15 to 50 psi (1,0 to 3,5 bars) and have a consistent flow rate of 0.5, 1.0, and 2.0 gallons per hour over this pressure range.
b) The emitters shall be self-flushing to minimize clogging.
c) The emitters shall be made of UV resistant acetyl externally.
d) The emitters shall be color-coded on the inlet side to identify flow rate. A blue inlet shall indicate an emitter with a flow rate of 0.5 gallons per hour (1,89 l/h), a black inlet shall indi-

cate a flow rate of 1.0 gallons per hour (3,79 l/h) and a red inlet shall indicate a flow rate of 2.0 gallons per hour (7,57 l/h).

e) The emitters shall be available with two inlet options: self-piercing barb inlet and 10-32 threaded inlet. The emitters with self-piercing barb inlet shall permit one-step insertion into ½" or ¾" drip tubing when installed with Rain Bird's Xeriman tool.

f) Models:

(1) With self-piercing inlet barb:

(a) XB-05PC (Blue) Barb inlet; 0.5 GPH (1,89 l/h)

(b) XB-10PC (Black) Barb inlet; 1.0 GPH (3,79 l/h)

(c) XB-20PC (Red) Barb inlet; 2.0 GPH (7,57 l/h)

(2) With 10-32 threaded inlet:

(a) XB-05PC-1032 (Blue) 10-32 Threaded inlet; 0.5 GPH (1,89 l/h)

(b) XB-10PC-1032 (Black) 10-32 Threaded inlet; 1.0 GPH (3,79 l/h)

(c) XB-20PC-1032 (Red) 10-32 Threaded inlet; 2.0 GPH (7,57 l/h)

2) Rain Bird Pressure-Compensating Modules:

a) Rain Bird Pressure-Compensating Modules shall be pressure compensating over the range of 10 to 50 psi (0.7 to 3,5 bar) and have a consistent flow rate of [5] or [7] or [10] or [12] or [18] or [24] gallons per hour over this pressure range.

b) The pressure-compensating modules shall be made of UV resistant acetyl externally.

c) The pressure-compensating modules shall be color-coded on the outlet side to identify flow rate. A tan outlet shall indicate an emitter with a flow rate of 5 gallons per hour (18,93 l/h), a violet outlet shall indicate a flow rate of 7 gallons per hour (26,50 l/h), a green outlet shall indicate a flow rate of 10 gallons per hour (37,85 l/h), a dark brown outlet shall indicate a flow rate of 12 gallons per hour (45,42 l/h), a white outlet shall indicate a flow rate of 18 gallons per hour (68,13 l/h) and an orange outlet shall indicate a flow rate of 24 gallons per hour (90,84 l/h).

d) The pressure-compensating modules shall be available with two inlet options: self-piercing barb inlet and 10-32 threaded inlet. The pressure-compensating modules with self-piercing barb inlet shall permit one-step insertion into ½" or ¾" drip tubing when installed with Rain Bird's Xeriman tool.

e) Models:

(1) With self-piercing inlet barb:

(a) PC-05: light brown, 5 GPH (18,95 l/h)

(b) PC-07: violet, 7 GPH (26,53 l/h)

(c) PC-10: green, 10 GPH (37,90 l/h)

(d) PC-12: dark brown, 12 GPH (45,48 l/h)

(e) PC-18: white, 18 GPH (68,22 l/h)

(f) PC-24: orange, 24 GPH (90,96 l/h)

(2) With 10-32 threaded inlet:

(a) PC-05 10-32: light brown, 5 GPH (18,95 l/h)
(b) PC-07 10-32: violet, 7 GPH (26,53 l/h)
(c) PC-10 10-32: green, 10 GPH (37,90 l/h)
(d) PC-12 10-32: dark brown, 12 GPH (45,48 l/h)
(e) PC-18 10-32: white, 18 GPH (68,22 l/h)
(f) PC-24 10-32: orange, 24 GPH (90,96 l/h)

3) Rain Bird Xeri-Bubbler™
   a) The Rain Bird Xeri-Bubblers shall be available in 3 different flow options: half-circle with 5 streams, full-circle with 8 streams and full-circle umbrella. The connections shall be [10-32 self-tapping thread], [¼" barb], or [5" spike]. The flow and radius shall be adjustable by turning the outer cap.
   b) The SXB series of Xeri-Bubblers shall have a flow range of 0 to 13 GPH (0 to 49,21 l/h). The UXB series of Xeri-Bubblers shall have a flow range of 0 to 35 GPH (0 to 132,48 l/h)
   c) The operating pressure range for the Xeri-Bubblers shall be 15 to 30 psi (1,0 to 2,0 bars)
   d) Models:
      (1) SXB-180-1032: Half-circle, 5 streams, 10-32 thread
      (2) SXB-180-025: Half-circle, 5 streams, 1/4" barb
      (3) SXB-180-SPYK: Half-circle, 5 streams, 5" spike
      (4) SXB-360-1032: Full-circle, 8 streams, 10-32 thread
      (5) SXB-360-025: Full-circle, 8 streams, 1/4" barb
      (6) SXB-360-SPYK: Full-circle, 8 streams, 5" spike
      (7) UXB-360-1032: Full-circle, umbrella, 10-32 thread
      (8) UXB-360-025: Full-circle, umbrella, 1/4" barb
      (9) UXB-360-SPYK: Full-circle, umbrella, 5" spike
4) Rain Bird PC Diffuser Cap
   a) The Rain Bird PC Diffuser Cap shall be made of UV-resistant polyethylene material.
   b) The PC Diffuser Cap shall be capable of snapping onto Rain Bird's pressure-compensating modules to create a bubbler effect and prevent wash out.
   c) The PC Diffuser Cap shall be available in black.
   d) Models:
      (1) For potable zones
         (a) PC Diffuser (Black)
5) Rain Bird Diffuser Bug Cap
   a) The Rain Bird Diffuser Bug Cap shall have a barb inlet and a flanged shield. The barb inlet shall fit into ¼" distribution tubing with ID of 0.16 inches (4 mm)..
   b) The flanged shield of the Diffuser Bug Cap shall diffuse water to minimize soil erosion at emission point.
   c) The Diffuser Bug Cap shall be made of polyethylene.
   d) The operating pressure range of the Diffuser Bug Cap shall be 0 to 50 psi (0 to 3,5 bars).
   e) The Diffuser Bug Cap shall be available in black.
   f) Models:
      (1) For potable zones
      (2) DBC-025 (Black)

(3) For non-potable zones

b. Broadcast Single-Outlet Emission Devices

1) Rain Bird Xeri-Pop™ Micro-Spray

a) The Rain Bird Xeri-Pop Micro-Spray shall be made of UV-resistant ABS externally.

b) The water inlet for the Xeri-Pop shall be a ¼" inlet located at the bottom of the unit that can be connected to ¼" distribution tubing.

c) The Xeri-Pop shall operate in the pressure range of 20 to 50 psi (1,4 to 3,5 bars) when water is supplied via ¼" distribution tubing.

d) The Xeri-Pop shall be available with a pop-up height of 6 inches.

e) The Xeri-Pop shall be capable of handling any low-volume nozzle with female threads, including Rain Bird Multi-Port nozzles, 5 series MPR nozzle, 5 series plastic bubbler and 8 series MPR nozzle.

f) Models:

(1) XP-600X: 6-inch pop-up

2) Rain Bird Xeri-Sprays™

a) Rain Bird Xeri-Sprays shall be available in 4 different flow patterns: quarter-circle spray, half-circle spray, full-circle spray or mister.

b) The flow and radius of each Xeri-Spray shall be adjusted by turning an integral ball valve.

c) The Xeri-Sprays shall be available with 10-32 self-tapping threads

d) The operating pressure range of the Xeri-Sprays shall be 10 to 30 psi (0,75 to 2,1 bars), and the flow within this pressure range shall be 0 to 31 GPH (0 to 117,34 l/h)

e) The radius of the Xeri-Sprays shall be 0 to 13.4 feet (0 to 4,1 m) full-circle; 0 to 10.6 feet (0 to 3,2 m) quarter-and half-circle.

f) Models

(1) XS-90: Quarter-circle, spray
(2) XS-180: Half-circle, spray
(3) XS-360: Full-circle, stream spray
(4) 360 ADJ Mister

3) Rain Bird Multi-Port Nozzle

a) Rain Bird Multi-Port nozzle shall have a flat trajectory performance and a square spray pattern.

b) The Multi-Port nozzle shall have 4 ports, and these can be configured open or close to create 5 different configurations. The Multi-Port nozzle shall be shipped with a Multi-Port Nozzle Punch Tool for this purpose.

c) The Multi-Port nozzle shall have standard female nozzle threads.

d) The Multi-Port nozzle shall operate in the pressure range of 15 to 70 psi (1,0 to 4,8 bars).

e) The Multi-Port nozzle shall be shipped with a 30 mesh drop-in screen.
f) Models:
(1) MP5SSQ - Spray nozzle, 5 ft (1,5 m) radius.
(2) MP2QS - Stream nozzle, 2 ft (0,6 m) radius.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 1: Section – Execution Requirements

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Coordinate work which is embedded in concrete or masonry and route under paved areas.

B. Provide timely delivery and installation at job site.

C. Protect adjacent structures, surfaces, and finishes. Do not move equipment over structures without written approval from Architect. Provide necessary protection such as board roading, drop cloths, etc., as required.

3.03 INSTALLATION

A. Sequencing:
1. Install sleeves under roads and pavement prior to commencement of paving.
2. Install sprinkler system after completion of site grading.

B. Minimum Cover Below Finished Grade:
1. Zone Lateral Pipe: Not less than 12 inches.
2. Mains: Not less than 24 inches.

C. Clearance Horizontally Between Lines:
1. Pipe 2 inches and smaller: 4 inches.
2. Pipe 2-1/2 inches and larger: 12 inches.
3. Other services: 12 inches.

D. Maintain a minimum 1 inch vertical clearance between lines crossing at an angle greater than 45 degrees.

E. Trench Width: Not less than 6 inches.

F. Install underground piping so that it is not in contact with concrete, existing piping or other hard objects. Provide a minimum clearance of 2 inches between piping and hard object.

G. Thrust blocks: Concrete thrust blocks shall be provided on the thrust side of mains.

H. Backfill: Division 1: Section – Earthwork
   1. Material shall not contain brick, rock lumber or organic materials subject to decomposing.
   2. Trenches, after backfilling, shall be water filled and settled to prevent aftersettling.
   3. Level with finished grade.
   4. After backfilling and water settling, soil around pop-up heads shall be tamped and heads left level with grade and plumb.

I. Piping Installation:
   1. Install plastic pipe in a manner to provide for expansion and contraction.
   2. Cut plastic pipe with a hand saw. Ensure a square cut. Remove burrs at cut ends prior to installation.
   3. Plastic to plastic joints shall be solvent-welded. Solvent compatible with pipe and able to withstand specified pressure requirements.
   4. Solvent Welded Joints:
      a. Thoroughly clean pipe and fitting with all purpose primer/cleaner and clean dry cloth.
      b. Apply a uniform coat of solvent to the outside of the pipe.
      c. Apply solvent to the fitting.
      d. Re-apply a light coat of solvent to the pipe and quickly insert into the fitting.
      e. Re-apply a light coat of solvent to the pipe and quickly insert into the fitting.
      f. Give the pipe or fitting a quarter turn to ensure even distribution of the solvent and make sure the pipe is inserted to the full depth of the fitting socket.
      g. Hold in position for 15 seconds.
      h. Allow joints to set at least 24 hours before pressure is applied to the system

J. Valves:
   1. Manual Valves: Install manual valves in a valve box extending from grade to valve body, with minimum of 4 inch cover measured from grade to top of valve stem.
   2. Automatic Valves:
      a. Install automatic valves plumb to within 1/16 inch, in a valve box extending from grad to valve body, with minimum of 4 inch cover measure from grad to top of valve stem.

b. Automatic valves installed under sprinkler heads may be installed without valve box,
c. Automatic drains valves: Locate downstream of each control valve at the low point.

K. Sprinklers and Quick Coupler:
1. Install plumb to within 1/16 inch.
2. Heads at Walks and Curbs: Set flush to within 1/8 inch.
3. Lower sprinkler heads to finished grade after lawn has become established and has settled.

L. Control Wire:
1. Bury wires taped to side of pipe in same trench.
2. Bundle multiple wires and tape together maximum 10 feet on center.
3. Provide a 10 inch loop in wire at each valve where controls are connected.
4. Provide 10 inch loop in wires at not over 100 foot intervals.
5. Make electrical splices waterproof.

3.04 CONSTRUCTION

A. Interface with Other work:
1. Locate and coordinate irrigated system work with underground utilities.
2. Coordinate irrigation system work with landscaping work.
3. Coordinate irrigation system sleeve installation with curbing and pavement work.

3.05 FIELD QUALITY CONTROL

A. Division 01: Section – Quality Control

B. Inspection:
1. Trenching.
2. Pressure supply line installation and testing.
3. Lateral line and electrical valves.
4. Coverage tests.

C. Testing and Flushing
1. Flushing:
a. After all piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, yard hydrant assemblies, and hose valves, thoroughly flush piping system under a full head of water.
b. Maintain flushing for 3 minutes through furthermost valve.
c. After flushing, cap all risers.
2. Adjusting:
a. Flush and adjust all sprinkler heads for optimum performance and to prevent over-spray onto walks, roadways, and building.
b. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, make such adjustments prior to

planting. Adjustments may include changes in nozzle size and degrees of arc as required.

c. Lower raised sprinkler heads within 10 days after notification by Architect.

d. Sprinkler heads shall be performed at no cost to Owner.

3. Testing:

a. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch. Prove water tightness.

b. Testing of pressure main lines shall occur prior to installation of electric control valves.

c. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system has been accepted.

d. Furnish force pump and accessory test equipment.

e. When the irrigation system is completed, perform a coverage test in the presence of the Owner or Owner's representative to determine if the water coverage for planting areas is complete and adequate. Correct inadequacies of coverage due to deviations from Drawings. Complete test before ground cover is planted.

3.06 SYSTEM OPERATION AND ACCEPTANCE

A. Operation:

1. Operate the completed system for the inspection at this time each sprinkler head shall be visually checked for coverage, adjustment, installation and performance; valves shall be inspected for adjustment, installation and proper automatic manual control; "record documents" will be checked for accuracy; cleanup of site will be checked; and general items such as manual drain valves, controller and quick couple valves will be inspected for the maintenance period.

B. Instruction:

1. Instruct Owner in complete operation and maintenance of the irrigation system including but not limited to the controller operation, maintenance of the system's filters, adjustment of heads and winterization of system.

END OF SECTION 32 84 00

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Standard Form of Construction Agreement, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Plants.
   2. Soil Preparation Materials.
   3. Miscellaneous Materials.
   4. Tree Planting.

B. Related Sections include the following:
   1. Division 32 Section “Irrigation System”

1.03 DESCRIPTION

A. Provide complete landscaping shown on Drawings.

1.04 QUALITY ASSURANCE

A. Provide plant materials in compliance with applicable State and Federal laws relating to inspection for diseases and insect infestation at growing site.

B. Observation at growing site does not preclude right of rejection at job site. Plants damaged in transit or at job site may be rejected.

C. Off-site sandy loam testing (paid by Landscape Contractor):
   1. Provide source of sandy loam soil to Architect for purpose of soil investigation.
   2. Test soil samples from both sources of pH, alkalinity, total soluble salts, porosity, sodium content, and organic matter.

1.05 REFERENCED STANDARDS

A. American Standard for Nursery Stock, approved October 27, 1980 by American National Standards Institute, Inc.

B. Hortus Third, 1976 - Cornell University

1.06 SUBMITTALS

A. Division 01: Section - Submittal Procedures

B. Samples: Submit for approval sufficient representative quantities of sandy loam, sharp sand, bark chips, peat moss, filter fabric and gravel. Samples shall be approved by Architect before use on project.

C. Submit three representative samples of each of the specified ornamental trees, shrubs, and ground cover plants for Architect's approval. When approved, tag, install and maintain as representative samples for final installed plant materials.

D. File Certificates of Inspection of plant material by State and Federal authorities with Architect, if required by State.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Preparation for Delivery:
   1. Balled and Burlapped (B&B) Plants: Dig and prepare shipment in a manner that will not damage roots, branches, shape, and future development.
   2. Container Grown Plants: Container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

B. Delivery:
   1. Packaged materials delivered in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
   2. Do not deliver more plant materials than can be planted in one day unless adequate storage and watering facilities are available on job site.
   3. If balled plants cannot be planted within 24 hours after delivery to site, protect root balls by heeling in with saw dust or other approved material.
   4. Protect during delivery to prevent damage to root ball or desiccation of leaves.
   5. Notify Architect of delivery schedule 48 hours in advance so plant material may be observed upon arrival at job site.
   6. Remove rejected plant material immediately from site.
   7. Do not lift, move, adjust to plumb, or otherwise manipulate plants by trunk or stems.

1.08 JOB CONDITIONS

A. Planting Restrictions: Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

B. Protections:

1. Do not move any equipment over existing or newly placed structures without approval of Architect and General Contractor. Provide necessary protections such as board-roading as required.
2. Protect other improvements from damage, with protection boards, ramps and protective sheeting as required.

C. Utilities:
1. Determine locations of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, if required, to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

1.09 WARRANTY

A. Warranty plants and trees for one year after substantial completion. Following Warranty Period Inspection, replace dead materials and materials not in vigorous, thriving condition as soon as weather permits and on notification by Architect. Replace plants, including trees, which in the opinion of the Architect, have partially died, thereby damaging shape, size or symmetry.

B. Contractor shall replace plants and trees with same kind and size as originally planted and dispose of dead material at no cost to Owner. Provide one-year guarantee on replacement plants. Trees should be replaced at start of next planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and other piping conduit or other work during replacement. Repair any damage immediately.

C. Guarantee excludes replacement of plants because of injury by storm, freeze or neglect by Owner.

D. Provide explicit maintenance and care instructions of all plant material.

PART 2 - PRODUCTS

2.01 PLANTS

A. General: Plants shall be equal to well-formed No. 1 grade or better nursery stock in accordance with requirements of applicable standards and as noted herein subject to Architect's approval. Listed plant heights are from tops of root balls to nominal tops of plants.

B. Ground Covers: Nursery grown, healthy, vigorous, of normal habit of growth for species, free from disease, insect eggs and larvae.

C. Ornamental Trees and Shade Trees: Healthy, vigorous, full-branched, well-shaped, trunk diameter and height requirements as specified. Balls shall be firm, neat, slightly tapered and well burlapped. Trees with loose or broken balls at time of planting shall be rejected. Trees will be individually approved by Architect.

2.02 TURFGRASS SOD

A. Turfgrass Sod: Approved Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Floratam St. Augustinegrass (Stenotaphrum secundatum Floratam).

2.03 PLUGS

A. Plugs: Turfgrass sod, approved Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, cut into square or round plugs, strongly rooted, and capable of vigorous growth and development when planted; of the following turfgrass species and plug size:
   1. Turfgrass Species: Floratam St. Augustinegrass (Stenotaphrum secundatum Floratam).
   2. Plug Size: 4 inches

2.04 SOIL PREPARATION MATERIALS

A. Sandy Loam:
   1. Friable, fertile, dark, loamy soil, free of clay lumps, subsoil, stones, and other extraneous material. Reasonably free of weeds and foreign grasses. Soil containing Dallis grass or Nutgrass shall be rejected.
   2. Physical properties as follows:
      Clay - between 7-27 percent Silt - between 28-50 percent Sand - less than 52 percent

B. Sharp Sand: Clean, washed sand, fine to coarse sizes.

C. Commercial Fertilizer: Commercial fertilizer shall be a complete fertilizer with an organic base. It shall be uniform in composition, dry, and free-flowing. Fertilizer shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed statements of analysis, and shall meet the following requirements, or equal, for approval.

2.05 MISCELLANEOUS MATERIALS

A. Steel Edging: 1/8" x 4" DuraEdge". Color Green.

B. Wrapping Material: Waterproofed, asphalt based paint with antiseptic properties, manufactured for use on tree wounds.

C. Tree Paint: Waterproofed, asphalt based paint with antiseptic properties, manufactured for use on tree wounds.

D. Mulch: Cypress bark decorative mulch rated 2 inch to 3 inches. Color to be selected by Architect.

E. Pea Gravel: Washed 3/4 inch native pea gravel.

F. Guying Materials:
   1. Tie Wire: 12 gauge galvanized wire.
   2. Black Hose: 2 ply, fiber reinforced hose, minimum 1/2 inch inside diameter.
   3. Eye Bolts: Galvanized steel, 3/8 inch eye, 6 inches long.
   4. Turnbuckles: Galvanized steel, 3/8 inch eye, 6 inch opening.
   5. Steel T Posts: 48 inch length.
   6. Colored flag attached to tie wire

G. Transite Edging: 3/8 Inch thick by 24 inches deep by 42 inches long corrugated transite edging.

H. Weed Stopper: "Processional Landscape Fabric", 3 oz Spunbond by Fabriscape, Chicago, IL

I. Erosion Control Netting: “Fabrijute”, Photo/Bio-degradable netting by Fabriscape, Chicago, IL

J. Perforated PVC pipe 4”

K. Perforated PVC pipe with cap 3”

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine subgrade upon which work is to be performed, verify grade elevations, that bed areas are left four inches low, observe conditions under which work is to be performed, and notify General Contractor of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Contractor. Notify Architect before proceeding.

3.02 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply superphosphate fertilizer directly to subgrade before loosening.
   2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
   b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
      a. Apply superphosphate fertilizer directly to surface soil before loosening.
   3. Remove stones larger than 2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
   4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.03 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
   1. Lay sod across angle of slopes exceeding 1:3.
   2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.04 PLUGGING

A. Plant plugs in holes or furrows, spaced 12 inches apart in both directions. On slopes, contour furrows to near level.

3.05 BED PREPARATION

A. Provide additional four inches of excavation for shrub beds and backfill eight inches deep; four inches deep for ground cover.

1 part sandy loam
1 part peat moss
1 part sharp sand
Add four pounds commercial fertilizer, as determined by testing, per 100 SF of bed area and mix thoroughly.

3.06 PLANT SPACING

A. Place plants in position on bed areas before containers have been removed. Obtain approval from Architect. Do not remove burlap from BB plants. Plant where located, setting plants with tops of balls even with tops of beds, and compact soil carefully around each plant ball. Water each plant thoroughly with hoses to eliminate air pockets. Carefully prune plants to remove dead or broken branches and hand-rake bed areas to smooth even surfaces. Architect reserves right to interchange or shift locations of plants prior to planting.

3.07 TREE PLANTING

A. Ornamental Trees: Plant trees in pits 12 inches larger than tree ball, backfill with prepared soil as defined above.

B. Shade Trees:

1. Plant in tree pits 2'-0" greater in diameter than root balls or to edge of tree leave-outs in paved areas. Remove excavated soil from site.
2. Coordinate with electrical contractor in cases where tree uplights are to be installed.
3. For those trees indicated on plans, slope bottom of tree well excavation to drain to sump. Install six inches of pea gravel in bottom of tree well. Provide single layer of filter fabric over gravel. Center tree in well.
4. Backfill pits with five parts sandy loam to one part peat moss and carefully settle by watering to prevent air pockets.

3.08 TREE GUYING

A. Complete guying as detailed immediately after trees are planted.

3.09 MULCHING

A. After planting has been completed and approved by Architect, mulch bed areas with bark mulch, two inches deep.

3.10 EDGING

A. Install metal edging to separate grass areas from ground cover and bed areas.

3.11 TREE WRAPPING

A. Wrap nursery grown trees. Extend wrapping from ground to a point immediately below lowest branch of each tree or as directed. Securely fasten in place with tacks or staples, so wrapping will remain in place two years.

3.12 PRUNING OF NEW PLANT MATERIAL

A. Trees are to be pruned to preserve natural character of plant and in a manner appropriate to its particular requirements in landscape design as determined by Architect. In general, remove at least one-third of wood by thinning branches. Do not cut leaders. Pruning in general shall be heavier on collected than on nursery grown plants. Remove soft wood or sucker growth and broken or badly bruised branches with a clean cut.

3.13 MAINTENANCE BY CONTRACTOR

A. The Contractor is responsible for maintenance of all trees, shrubs, ground cover and turf, including all necessary watering, cultivating, weeding and spraying until substantial completion of the entire project. Plant materials shall be kept in a healthy and vigorous condition with all bed areas kept neat.

B. Water will be available on site at no expense to the Contractor. Hose and other watering equipment required for maintenance by Contractor shall be furnished by Contractor at his expense. Additional water will be available as sprinkler system becomes operational, but this in no way relieves the Contractor of maintenance of plant material until acceptance by the Owner.

C. Grass areas shall be mowed at regular intervals to maintain a maximum height of two inches. Do not cut more than 1/3 of grass blade at any one mowing. Remove clippings after mowing.

END OF SECTION 32 93 00

SECTION 33 06 00 - UTILITY SERVICES

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. Section Includes:
   1. Furnish all labor, materials, services, equipment and appliances required in conjunction with or properly incidental to the furnishing and installation of site drainage system complete as indicated on the Drawings and as specified herein, including:
      a. Layout of drainage and utility lines
      b. Excavation for trenching, de-watering and backfilling
      c. Reinforced concrete drainage structures and related covers, grates and frames
      d. Connection of drainage piping to existing drainage line
      e. Lateral drainage lines to locations indicated on Drawings for connection to roof drainage piping
      f. Water distribution system
      g. Sanitary sewer system
      h. Gas distribution system
      i. Removal of excess excavated material off-site
      j. Provide trench safety design as required for fire hydrant work.
   2. Systems shall start at a point approximately 5 feet beyond the exterior walls of the building and extend to termination unless otherwise indicated on the Drawings.

B. Related Sections include the following:
   1. Division 01 Section “Information Available to Bidders - Geotechnical Report.”
   2. Division 22 Section “Connection to Building Systems.”
   3. Division 32 Section “Excavating, filling, grading of site.”

1.03 QUALITY STANDARDS

A. Meet requirements and recommendations of applicable portions of the Standards listed.
   1. Applicable publications of local governing authority
   2. American Society for Testing and Materials, ASTM.
   3. Texas Highway Department Standard Specifications for Construction of Highways, Streets, and Bridges, 1972, THD.
   4. Texas Trench Excavation Law.

1.04 SUBMITTALS

A. Division 1 Section - Submittal Procedures: Procedures for submittals.

B. Product Data: Submit copies of manufacturer's literature showing details of fabrication and installation of valves, vaults, clean-out boots, fire hydrants, flush hydrants, concrete pipe, joint materials, covers, grates and frames.

C. Shop Drawings: Submit manufacturer's data showing details of precast concrete structures related with site drainage.

D. Certification: Furnish Owner a certification from pipe manufacturer stating that pipe conforms to Specification requirements.

1.05 TESTING

A. Listed herein a minimum testing requirements. Cost for making these tests will be paid for by the Contractor.

B. Backfill: One laboratory test, TEX 114-E, for soil density shall be made for each type of soil used as backfill material. When a test has been made previously on similar soil, a duplicate test will not be necessary.

C. Reinforcing Steel: Furnish the Architect a certification from the steel fabricator or manufacturer stating that reinforcing steel conforms to Specification requirements.

D. Portland Cement Concrete: Contractor may use mix design currently being used which meets Specification requirements. In lieu of this, provide samples of materials proposed for use in Portland Cement concrete. Testing laboratory will determine that cement and aggregates meet requirements of these Specifications. Laboratory shall then prepare mix design which conforms to Specifications. New mix design will be required if materials are changed or if concrete does not meet strength or workability requirements.

PART 2 - PRODUCTS

2.01 CONCRETE PIPES FOR STORM SEWER SYSTEM

A. Reinforced - ATSM C76 Class III Joints -
   1. Pipe of 12" diameter and over - Tongue and groove with neoprene or other approved gasket.
   2. Fittings and specials - Gasket type joints as required for pipe being connected.

2.02 CONCRETE STRUCTURES

A. Portland Cement: Shall be of a standard brand and shall conform to the latest ASTM designation C150, Type 1.

B. Aggregates for concrete: Fine or coarse aggregate and shall meet the requirements of THD, Item 421.

C. Concrete: Composed of Portland Cement, coarse aggregate, fine aggregate, water, mineral filler and/or admixtures, if permitted by the Architect. Concrete shall have a minimum compressive strength at 28 days of not less than 3000 psi and shall have a maximum water-cement ratio of 7.0 gallons per sack, minimum cement content of 5.0 sacks per cubic yard, and a slump from two (2) to three (3) inches. Measuring materials, batching, and mixing shall conform to ASTM Designation C94.

D. Reinforcing Steel: Conforming to ASTM Designation A615 of grade 40 or 60.

E. Cast Iron Rings, Covers, and Grates: Shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow holes, and other defects in positions affecting their strength and value for the service intended. Angles shall be filleted and arises shall be sharp and true. Surfaces shall be machined where indicated or where otherwise necessary to secure true, flat surfaces. Covers and grates shall fit properly into frames, and seat uniformly and solidly.
   1. Castings: Conforming to the following ASTM Designation:

Gray-Iron Castings	A48 Class 50
Malleable Castings	A47 35018
Ductile Iron Castings	A395 60-45-15

F. Inlets: Precast concrete inlets as indicated on the Drawings or approved equal.

2.03 CAST IRON PIPE

A. U.L. approved and accepted by State Fire Insurance Commission without penalty. Manufactured in accordance with Federal Specification WW-P-42, AWWA C1-6-53 (ASA A21.6) or AWWDA C108-53 (ASA A21.8), Class 150. Centrifugal cast pipe shall have metal thickness based on tensile strength of 18,000 pounds per square inch and modulus of rupture of 40,000 pounds per square inch. It shall be designed for five foot cover, trench condition B. For any variation in the above physical strength values, there shall be a corresponding variation in metal thickness based on the ASA approved formula in Manual for Computation of Strength and Thickness of Cast Iron Pipe (A21.1- 1939).
   1. Joints: One of the following types:
      a. Push-On: AWWA C111 rubber gaskets and lubricant.
      b. Mechanical: AWWA C111 ductile iron or gray-iron glands, high strength bolts and nuts and rubber gaskets.
   2. Gasket:
      a. American-Fastite Joint
      b. Lone Star-Bell-Tite Joint
      c. U.S.-Tyton
      d. or approved equal.
   3. Fittings: AWWA C100-08 or C110-53 (ASA A21.10) bell and spigot type Class D, or AWWA C111-53 (ASA A21.11) mechanical joint type.
   4. Lining: Outside tar coated, inside cement lined and sealed in conformance with AWWA C104-53 (ASA A21.4) except that cement lining may be half thickness in conformance with Federal Specification WW-P-421.
   5. Solder Filler Metal: ASTM B32, Alloys Sn 95, Sn 94, ORE. Site Potable Water Lines and Underground Chilled Water (CHW) Piping System: No solder will be used with lead content.

2.04 STEEL PIPE

A. Standard line pipe with plain ends, beveled for welding in random lengths, with welded fittings such as tube turns of same thickness as the pipe, unless otherwise required.
   1. Flanges for connecting to valves - Forges steel welding neck designed for 150 PSI pressure, unless indicated otherwise.
   2. Gaskets - 1/16" thick
      a. American Standard
      b. Rainbow
      c. or approved equal.
   3. Tees for connecting service lines to main:
      a. For new empty mains: Mueller Brass Co., H-17701 and 17500 or approved equal butt-welded type.
      b. For existing mains in use: Mueller Brass Co., H-17570 or approved equal.

2.05 PVC PIPING AND FITTING ASSEMBLY

A. Piping and Fittings: PVC plastic pipe AWWA C900, class 150 or 200 for water piping and provide with bell end and ASTM F 447 elastomeric seal gasket and plain end for PVC elastomeric gasket fittings. ASTM D 3034, SDR 35 for sewer piping.

B. Gaskets: ASTM F 477, elastomeric seal.

C. Solvent: ASTM D 2564, use type and procedures recommended by pipe manufacturer to make solvent-welded joints. Thoroughly clean pipe and fitting of dirt, dust, and moisture before applying solvent.

D. PVC to Metal Connection: Work metal connection first. Use a non-hardening pipe dope such as Permatex No. 2 on threaded PVC to metal joints. Use only light wrench pressure.

E. Threaded PVC Connection: Where required, use threaded PVC adapters into which pipe may be welded.

F. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid green in color with continuously-printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

2.06 TAPPING SLEEVE AND VALVE

A. Suitable for tapping cast iron water main under pressure and having a mechanical end joint. Kennedy Valve Company - 950X, or approved equal.

2.07 GATE VALVES

A. Water distribution - Designed for 150 pounds per square inch minimum working pressure. End design to conform to piping design. Clear waterway through valve shall equal nominal diameter of the valve. Valve shall have a 2" square operating nut turning counter clockwise to open with direction indicated by an arrow cast in the metal.
   1. Sizes less than 2" - Of brass conforming to Dereal Specifications WW-V-54, Type 1, Class B.
   2. Sizes 2" to 4" - Having cast iron body, brass-mounted, conforming to Fed Spec WW-X-58, Class A or AWWA standard C500, double disk type, non-rising stem.
   3. Sizes 4" and larger for fire protection - Nonrising Stem, UL 262, FM approved, iron body and bonnet with flange for indicator post, bronze seating material, inside screw, 175-psig (1200 kPa) working pressure, mechanical joint ends. Provide with flanged ends for pit installation.

2.08 STOP COCKS

A. Cast iron body, designed for 125 pounds per square inch working pressure. Mueller Lub O SEAL, H-11170 and H-11175, or approved equal.

2.09 VALVE BOXES

A. Water system - Of cast iron complete with lock-type cover operated by a special wrench and having the word "WATER" cast in the cover. Boxes shall be of the extension type with screw or slide-type adjustment and with flared base. Metal shall be 3/16" minimum thickness.

2.10 CLEAN OUT BOOTS

A. Cast -iron ferrule and countersunk brass cleanout plug, with round cast iron access frame and heavy duty, secured, scoriated cast iron cover shall be Trinity Valley 1684, or approved equal.

2.11 BACKFILL MATERIAL:

A. Borrow: Reused excavated or equal borrow material; low expansiveness, uniform in grade, free from organic materials, capable of being compacted to 95 percent maximum density at optimum moisture content; ASTM D-698.

1. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accord with ASTM C136.

B. Bedding:
   1. Washed gravel, 1/4" to 1-1/2" in size.
   2. Screened pit run gravel passing 1-1/2" sieve and retained on 1/4" sieve.
   3. Pea gravel passing 5/8" sieve and retained.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall furnish all labor, tools, materials and incidentals required to complete the work.

B. The Contractor shall lay out all work included herein and shall determine the elevations of existing piping at all tap locations and furnish that data to the Owner for review of flow capacity.

3.02 EXCAVATION:

A. The Contractor shall excavate all materials encountered regardless of the difficulties encountered. The ditch shall be no greater in width or depth than is necessary to permit construction in accordance with the plans and specifications. The maximum width of trench at top of pipe without sheeting, shoring and bracing shall be the external diameter of the pipe plus eight inches.

B. The Contractor shall determine the need for sheeting and bracing to safeguard the workmen. When sheeting and bracing are necessary the trench or excavation shall be dug to such width that proper allowance is made for the space occupied by the sheeting. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and protect all persons or property from injury or damage. Sheeting, shoring and bracing shall not be left in place, but shall be removed in such a manner as not to endanger or damage new or existing structures. All holes or voids left by the removal of sheeting shall be backfilled.

C. Soft, Spongy or otherwise unstable material which will not provide a firm foundation for the pipe shall be removed and replaced with suitable material from the excavation or other sources approved by the Architect and shall be compacted as provided for in the Specifications. When unstable conditions are not corrected by the above means, the Contractor will be required to use rock, gravel, concrete or timber foundations. The type of foundation shall be determined by the Architect. There will be no extra compensation for this work.

3.03 BEDDING:

A. Trenches for pipe shall be excavated to a minimum depth of three inches below the grade of the outside of the pipe. Trenches shall then be filled up to and around the pipe exterior for at least 15 percent of its overall height with one of the following materials:

B. Other type of bedding shall be provided when designated on the Drawings.

3.04 BACKFILL:

A. After the pipe has been installed, selected material from the excavation at a moisture content with which the required density can be obtained shall be placed equally along both sides of the pipe in layers not exceeding six inches loose depth. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by hand or pneumatic tampers until the fill has reached an elevation

12" above the top of the pipe. The remainder of the backfill shall be placed in layers not exceeding 10" loose depth and shall be compacted by an approved method which will obtain the density of the adjacent undisturbed soil. Backfill for utilities under pavements and curbs and gutters shall be compacted in 6" layers to a density not less than 95 percent of maximum density at optimum moisture content of Standard Proctor Density. Water jetting will not be permitted.

1. Structures: Place backfill, as far as possible, as the work progresses, evenly on all sides of the structure. Remove forms, shoring, sheeting, bracing, etc., before starting to backfill and do not backfill against concrete until directed, which in general shall be at least 7 days after placement. Take care to prevent any wedging action of backfill against structure.

3.05 STORM SEWER SYSTEM

A. No pipe shall be laid until it has been inspected and approved. All pipe shall be laid and jointed in the dry. The pipe shall be laid up-grade beginning at the lower end of the line. Pipe shall be laid accurately to line and grade. When the entire pipe has been checked for line and grade, the body of the pipe shall be back-filled with enough earth or concrete on both sides to hold the pipe firmly in position.

B. Wye Connections: The connection of one pipe to another may be accomplished with a precast wye or by means of pipe-to-pipe connection. A pipe-to-pipe connection shall be made by cutting a hole in the larger pipe slightly larger than the outside diameter of the pipe to be connected. The smaller pipe to be connected shall not project into the larger pipe. A concrete collar not less than 6" thick and 6" wide shall be placed around the smaller pipe on the exterior surface of the larger pipe.

C. End-to-end Connections: Whenever a smaller pipe is jointed end-to-end to a larger pipe, the inside tops of the two pipes shall be matched. The void between the pipes shall be filled with cemented brick work or where this is not possible the void shall be filled with concrete or mortar. In either case, a concrete collar not less than 6" thick and 6" wide shall be placed over the joint.

3.06 SANITARY SEWER SYSTEM

A. Pipe: As required per City specification.

B. Location: Where specific dimension is not shown, sewer shall be located at least 10' horizontally from any water supply or service line. Crossing above water lines: Construct gravity sewers which pass over water lines of Cast Iron Pipe for a distance of 9' each side of the crossing. No joint shall occur within 3' each side of the crossing.

C. Laying Pipe: Shape the bottom of the trench to give substantial uniform circumferential support to the lower fourth of the pipe. Lay pipe proceeding upgrade with the spigot ends of the bell and spigot pipe and the tongue ends of tongue and groove pipe pointing in the direction of flow. Lay each section true to line and grade in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow lines. As the work progresses, clear the interior of the pipe of all dirt and superfluous material. Where cleaning after laying is difficult due to small pipe size, keep a suitable swab or drag in the pipe and pull it forward past each joint immediately after the jointing is complete. When work is not in progress, plug the ends closing them by another approved method. If maximum width of the trench at the top of the pipe exceeds the specified dimension for any reason other than by direction, provide at no additional cost such concrete cradling, pipe encasement or other bedding as may be required to satisfactorily support the added load of backfill.

D. Infiltration: Leakage into the sewer shall not exceed 500 gallons per inch of nominal diameter per day per mile of pipe for any section between successive manholes. If the infiltration rate does not appear to be acceptable, measure the amount of leakage with a suitable weir or other device as directed. If the measured rate of infiltration exceeds the acceptable maximum, make correction in the system until it becomes acceptable.

E. Manholes: Construct manholes of precast concrete sections or of brick. Covers and frames shall be of cast iron. Invert channels shall be smooth and semi-circular in shape, conforming to the inside of the adjacent sewer section. Make changes in direction of flow with a smooth curve of as large a radius as the manhole size will permit. Changes in size and grade of the channels shall be made gradually and evenly. Form the invert channels directly in the concrete of the manhole base or by use of a half tile laid in concrete, or by laying full-section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than 1" per foot nor more than 2" per foot. Free drop inside the manhole shall not exceed 2'-6" measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels. Construct drop manholes whenever the free drop would otherwise be greater than 2'-6". In all manholes, provide steps of cast iron. Width of steps shall not be less than 10", set them approximately 15" apart and with alternate steps off-set 6". Rungs of 7/8" diameter wrought iron, galvanized after fabrication, may be substituted for steps and may be installed without offset if the crossbar is not less than 14" long. Rungs shall be formed so that crossbar is sufficiently below plane of side bar to prevent foot from slipping off. Provide not less than 6-1/2" of toe room at each rung, measured from inside face of the crossbar.

F. Clean-outs and Stacks: Use pipe of the same material as the mainline and of 6" diameter unless shown otherwise. Provide removable standard pipe plugs.

G. Testing: Sewer mains will be checked to determine any displacement of the pipe after trench has been backfilled 2' above the pipe and compacted. Testing shall be with a light flashed between manholes or manhole location. If poor alignment or displacement or other defects are discovered, they shall be corrected as directed.

3.07 WATER DISTRIBUTION SYSTEM

A. Pipe Material and Preparation: Use PVC pipe. Before lowering pipe into trench, clean the interior of all foreign matter, inspect the pipe for defects. Defective, damaged or unsound pipe must be removed from the site.

B. Laying Pipe: The full length of each pipe section shall rest solidly upon the pipe bed with recesses excavated to accommodate bells and joints. Keep pipe interior clean and dry during laying operations. When work is not in progress, plug the ends or close them by another approved method. Do not lay pipe with bells facing in direction of laying. Do not lay pipe closer than 10' to a sewer. At cross-overs with sewers, no joint in the water line shall be closer than 9' from the cross-over point. Where possible, lay water lines 6' above sewers at cross-overs. Provide valves, plugs or caps, as required, where pipe ends are left for future connections. Deflections from a straight line or grade as required by vertical or horizontal curves of off-sets shall not exceed 6/D inches per lineal foot of pipe, between the center lines, extended, of any 2 connecting pipes. D represents the nominal pipe diameter in inches. If alignment requires deflection in excess of this limitation, use special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits.

C. Cutting Pipe: Use an approved type of mechanical cutter. Use wheel cutters when practical.

D. Pipe Joints: Install Mechanical Joints according to joint manufacturer's recommendations. Center the spigot in the bell, push the pipe in position and bring it into required alignment.

E. Valves: Where feasible, locate valves outside the area of roads and streets. Set valves plumb. Unless shown otherwise, provide a valve box over each outside gate valve. Box shall be of such length as will be adapted, without full extension, to the depth of cover required over the pipe at its location. Center the box on the valve. Carefully tamp earth fill around the box to a distance of 4' on all sides or to the undisturbed trench face if less than 4'.

F. Meter and Meter Vault: Valves and fittings in meter vault shall be bolted flange type with ring gaskets.

G. Meter Vault: Per City Specifications.

H. Anchorage of Fittings: Anchor tees, bends and plugs in mains with thrust blocks formed of 2,500 p.s.i. 28 day strength concrete.

I. Sterilization: Sterilize each unit of completed distribution system, using chlorine, before it is accepted for domestic operation. If possible, flush the lines thoroughly before introduction of chlorinating material. The amount of chlorine shall be such as to provide a dosage of at least 50 parts per million. The chlorinating material shall be introduced into the system by an approved method. It shall remain in the system for a contact period of at least 24 hours and until the pressure test required below is complete. During this time valves in the system shall be opened and closed several times. After the contact period, flush the system with clean water until the residual chlorine content is depleted or not greater than 0.5 part million. Then take Bacteria samples as directed and submit them to the State Health Department Laboratory for analysis. Final results of the test shall indicate no chlorine bacteria present in the samples. Water mains shall meet State Health Department requirements before acceptance.

J. Testing: During sterilization contact period, test the system. Piping shall have been laid, joints completed and trench partially backfilled but leaving the joints exposed for examination. Unless otherwise required, expel air in the line and subject it to a hydrostatic pressure test of 50 pounds per square inch in excess of the anticipated static pressure at the points of reading when the system is pit in operation. Maintain the pressure for one hour. Exposed pipe, joints, fittings, valves and accessories shall be inspected. Tighten or remake defective joints. Replace defective material and repeat the test until results are satisfactory. Conduct open trench tests for 2 hours and covered trench tests for 24 hours. Provide all plugs, valves, pumps, equipment and labor necessary for conducting the tests. Assume responsibility for damage and/or contamination to existing connecting supply mains.

K. Special Requirements: Where conditions prevent the actual visible inspection of each joint or when the joints are made of a material other than lead such that leakage diminishes as the material in the joints ages, provide a calibrated gauge and meter to determine the quantity of water lost by leakage under normal operating pressure. To be accepted, any leakage (evaluated on a pressure basis of 150 pounds per square inch) must be less than 100 U.S. gallons per 24 hours per mile of pipe, per inch nominal diameter or pipe for pipe in 12 foot lengths, 75 gallons for pipe in 16 foot lengths, and varies proportionately for other pipe lengths. In calculating leakage, make allowance for added joints in the pipeline above the normal for unit lengths of pipe. Should any test of combined sections of pipeline disclose leakage greater than the acceptable limit, make repairs until the leakage is reduced to, at most, the acceptable limits.

3.08 CLEAN UP

A. Upon completion of the work covered by this Section, the Contractor shall clean up all work areas by removing all debris, surplus materials, and equipment from the site. The ground surface shall be restored to its original condition as nearly as possible.

3.09 PROTECTION

A. Properly protect existing utility lines shown on the Drawings from damage due to these operations. If damage occurs, satisfactorily repair it at no additional cost. If damage occurs to an unknown line, give immediate notification.

END OF SECTION 33 06 00