SPECIFICATIONS

City of La Joya

New Public Safety Building and City Hall

La Joya, TX.

More Attentive Service

Milnet Architectural Services, PLLC

608 S. 12th Street
McAllen, Texas 78501

Phone: 956-688-5656
Fax: 956-687-9289
Website: www.milnet-archservices.com

Project No. 215009

Set No.:

USDA Funded Project

Owner: City of La Joya
By: Date:

Contractor: Holchemont Ltd.
By: Date:

Architect: Milnet Architectural Services
By: Date:

USDA RD: Roel R. Gomez
By: Date:

City of La Joya
New Public Safety Building & City Hall

PROJECT MANUAL

Plans and Specifications – Project No. 215009

City of La Joya
New Public Safety Building and City Hall
La Joya, Texas 78560

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
333 Guadalupe, Suite 2-350, AUSTIN, TX 78701-3942
(Tel: 512/305-9000)
HAS JURISDICTION OVER INDIVIDUALS LICENSED UNDER
THE ARCHITECT'S REGISTRATION LAW
ARTICLE 249a, VERNON'S CIVIL STATUTES".

MILNET ARCHITECTURAL SERVICES, PLLC
608 S. 12th St.
McALLEN, TEXAS 78501
(956) 688-5656 - FAX (956) 687-9289

City of La Joya
New Public Safety Building
New City Hall and Renovations
La Joya, Texas 78560
Project No. 215009

TRINITY
MEP ENGINEERING

3533 Moreland Dr. Suite A | Weslaco, Texas 78596
P: 956.973.0500 | F: 956.351.5750
www.trinitymep.com | Copyright 2017
Texas Registered Engineering Firm No. - F10362

1/19/2017

DIVISION 15 – MECHANICAL

15010	SUMMARY OF MECHANICAL WORK
15050	BASIC MECHANICAL MATERIALS AND METHODS
15060	HANGERS AND SUPPORTS
15070	SUPPORTS AND ANCHORS
15075	MECHANICAL IDENTIFICATION
15081	DUCT INSULATION
15083	PIPE INSULATION
15110	VALVES
15140	DOMESTIC WATER PIPING
15150	SANITARY WASTE AND VENT PIPING
15183	REFRIGERANT PIPING
15190	SYSTEM IDENTIFICATION AND PIPE MARKING
15240	SOUND AND VIBRATION CONTROL
15330	WET TYPE FIRE SPRINKLER SYSTEM
15410	PLUMBING FIXTURES
15415	DRINKING FOUNTAINS AND WATER COOLERS
15430	PLUMBING SPECIALTIES
15485	ELECTRIC, DOMESTIC WATER HEATERS
15801	VARIABLE CAPACITY INDOOR AIR HANDLING UNITS
15802	VARIABLE CAPACITY AIR COOLED CONDENSING UNITS
15815	METAL DUCTS
15820	DUCT ACCESSORIES
15837	CENTRIFUGAL FANS
15855	AIR DEVICES (GRILLES)
15990	TESTING, ADJUSTING, AND BALANCING

DIVISION 16 – ELECTRICAL

16010	SUMMARY OF ELECTRICAL WORK
16020	BASIC ELECTRICAL REQUIREMENTS
16050	BASIC ELECTRICAL MATERIALS AND METHODS
16055	SITE ELECTRICAL
16060	GROUNDING AND BONDING
16075	ELECTRICAL IDENTIFICATION
16120	BUILDING WIRE AND CABLE
16130	RACEWAYS AND BOXES
16140	WIRING DEVICES
16190	SUPPORTING DEVICES
16440	DISCONNECT SWITCHES
16442	PANELBOARDS
16475	FUSES
16511	INTERIOR LIGHTING
16521	EXTERIOR LIGHTING
16620	STANDBY ENGINE – GENERATOR SET
16693	BRANCH CIRCUIT PANELBOARD POWER CONDITIONING SURGE PROTECTION DEVICE
16721	FIRE ALARM / LIFE SAFETY SYSTEMS
16726	INTRUSION DETECTION SYSTEM
17300	TECHNICAL CABLING SYSTEM SPECIFICATION
17400	VIDEO SURVEILLANCE

MILNET ARCHITECTURAL SERVICES
608 SOUTH 12TH ST.
McALLEN, TEXAS 78501

ARCHITECT'S CERTIFICATION
OF
NO CHANGE IN FEDERAL CONTRACT DOCUMENTS

This is to certify that no change (alterations, modifications, or deletions) have been made in the reproduction of USDA, Rural Development Standard Contract Documents, with the exception of the following:

-Invitation for Proposals (00025) in lieu of the Agency's Advertisement for Bids (Guide 19 Attachment 1)

-Proposal Instructions (00100) in lieu of the Agency's Information for Bidders (Guide 19 Attachment 2)

-Proposal Form (00310) in lieu of the Agency's Bid Form (Guide 19 Attachment 3)

Rodolfo Molina Jr

Seal:

Signature:

Date: January 19, 2017

Form RD TX 1942-44
(04/2006)

U. S. DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT

PLAN CERTIFICATION

(Property Name/Applicant's Name and Case Number)	
City of La Joya New Public Safety Bldg & City Hall Renovations	
(Property Address)	(City)
701 E. Expressway 83	La Joya
(County)	(State)
Hidalgo	**Texas**

I, Rodolfo R. Molina, Jr. (type or print) being a Licensed Architect (licensed architect, engineer, or authorized building official, etc.)

in the State of Texas, hereby certify that the plans and specifications dated January 19, 2017

prepared by Milnet Architectural Services, PLLC (name of firm or individual) for the above property are acceptable.

To the best of my/our knowledge, information, and belief, these documents comply with the:

International Building Code 2012, Texas Accessibility Standards and
(name and edition of the applicable development standard, code, etc.)

International Energy Conservation Code 2012
(name and edition of the applicable energy standard/requirements)

designated as the applicable Rural Development standards for this project.

I understand the purpose of this certification is to induce Rural Development to finance the construction of the above project and plan. I further understand that false certification constitutes a violation of 18 U.S.C. Section 1001 punishable by fine and/or imprisonment and, in addition, may result in debarment from participation in future government programs.

Rodolfo R. Molina, Jr. (Signature)

January 19, 2017 (Date)

Rodolfo R. Molina, Jr. (Type or print name)

14740 (Professional Registration No.)

President (Title)

n/a (Expiration date if applicable)

956-688-5656 (Area Code + Telephone Number)

TX PN No. 50 (4/2006)

SUPPLEMENTAL INFORMATION FOR BIDDERS

Each bid in excess of $100,000.00 must be accompanied by Lobbying Activity Certification, as required by Public Law (PL) 101-121. The certification form provided in the bidding documents, must be signed and dated by the bidder. Any bids submitted with out the certification will be rejected.

CITY OF LA JOYA
NEW CITY HALL AND PUBLIC SAFETY BUILDING
REQUEST FOR PROPOSALS

Holchemont Ltd., Construction Manager for the City of La Joya, will receive sealed proposals from sub-contractors and/or suppliers for the construction of a project titled **City of La Joya New City Hall and Public Safety Building on Tuesday, February 07, 2017 at 4:00 pm** at the office of Holchemont Ltd., located at 900 North Main St., McAllen, Texas 78501.

Proposals are to be submitted in a sealed envelope indicating Proposer's name and marked **"Proposal for City of La Joya New City and Public Safety Building"** and addressed to "Michael Montalvo, Holchemont Ltd., 900 North Main St., McAllen, Texas 78501".

Submit proposals for any of the following specifications sections:

City of La Joya New City Hall and Public Safety Building:
Division 2 Site Work, Division 3 Concrete, Division 4 Masonry, Division 5 Steel, Division 6 Wood and Plastics, Division 7 Thermal And Moisture Protection, Division 8 Doors and Windows, Division 9 Finishes, Division 10 Specialties, Division 11 Equipment, Division 13 Special Construction, Division 15 Mechanical & Division 16 Electrical

Contract Documents are on file at the Rio Grande Valley AGC Plan Rooms, Dodge Reports, and Builders Exchange of Texas at which locations the plans and specifications may be examined.

Copies of the Contract documents may be obtained by providing a check payable to Holchemont, Ltd. in the amount of $200.00 for each set of the documents. Documents may be obtained from **RGV REPROGRAPHICS** at the following address:

RGV Reprographics
519 S. Broadway
McAllen, Texas 78501
(956) 686.1525

The deposit will be refunded if the documents and drawings are returned in good condition within 10 days following proposal due date.

A Pre-Proposal Conference will be conducted at the proposed project site, 701 E. Expressway 83, La Joya, TX. 78560 on Monday, January 30, 2017 at 10:00 a.m. All firms proposing to submit proposals on this project are strongly encouraged to attend.

For questions regarding contract documents contact via email Michael Montalvo at: bids@holchemont.com

Attention is called to the fact that not less than the federally determined prevailing wage rates must be paid on this project. In addition, successful bidders must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, disability, or national origin.

Holchemont Ltd. reserves the right to reject any or all of the proposals or to waive any informalities in the bidding process. Proposals may be held for a period not to exceed 45 days from the date of the proposal due date for the purpose of reviewing the proposals and investigation of the bidders qualifications prior to awarding construction contracts.

Holchemont Ltd. does not discriminate on the basis of race, color, national origin, sex, religion, age, and handicapped status in employment or provisions of service.

SECTION 00100 - PROPOSAL INSTRUCTIONS

1. Proposal Documents

Complete sets of Proposal Documents must be used in preparing Proposals; neither Owner, Architect, or Construction Manager at Risk assume responsibility for errors or misinterpretations resulting from use of incomplete set of Proposal Documents.

2. Qualifications of Bidders

To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five (5) days after Proposal opening upon Construction Manager's request detailed written evidence such as financial data, previous experience, present commitments and other such data as may be deemed necessary to award contract that offers the best value to the Owner.

3. Examination of Contract Documents and Site

It is the responsibility of each Bidder before submitting a Proposal: To examine thoroughly the Contract Documents and other related data identified in the Proposal Documents;

To visit the site to become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work;

To consider federal, state, and local Laws and Regulations that may affect cost progress, performance of furnishing of the Work;

To study and carefully correlate Bidder's knowledge and observation with the Contract Documents and such other related data; and

To promptly notify Architect or Construction Manager of all conflicts, errors, ambiguities or discrepancies which the Bidder has discovered in or between the Contract Documents and such other related documents.

Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and underground facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Paragraph 4.2 and 4.3 of the General Conditions.

On request, Construction Manager will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies, as each Bidder deems necessary for submission of a Proposal. Bidder must fill all holes and clean up and restore site to its former conditions upon completion of such explorations, investigations, tests and studies or at the end of each day.

The submission of a Proposal will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Article 3, that without exception the Proposal is premised upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Architect/Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the work.

4. Availability of Lands for Work

The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by the Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the Construction Manager. Easements for permanent structures or permanent changes in existing facilities are to be obtained and

paid for by Owner unless otherwise provided in the Contract Documents.

5. Interpretations and Addenda

All questions about the meaning or intent of the Proposal Documents are to be directed to Construction Manager. Interpretations or clarifications considered necessary by Construction Manager in response to such questions will be issued by Addenda to all parties recorded by Holchemont Ltd. as having received the Proposal Documents. Questions received less than three (3) days prior to the date for opening of Proposals may not be answered. Only questions answered by formal written Addenda will be binding. Oral or other interpretations or clarifications will be without legal effect.

6. Proposal Bond

No Proposal Bond Required.

7. Payment and Performance Bond

P&P Bonds required for mechanical and electrical divisions of project.

8. Contract Times

The project will be substantially completed by _____.

9. Liquidated Damages

Provisions for liquidated damages, if any, are set forth in the Contractor/Subcontractor Agreement.

10. Substitute and “Or-Equal” Items

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or “or-equal” items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to Architect and Construction Manager, application for such acceptance will not be considered by Architect or Construction Manager until after the Effective Date of the agreement.

11. Subcontractors, Suppliers and Other

If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Construction Manager in advance of a specified date prior to the Effective Date of the Agreement, apparent successful Bidder, and any other Bidder so requested, shall within five (5) days after Proposal opening submit to Construction Manager a list of all Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, person or organization if requested by Construction Manager. An Owner or Construction Manager who after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, may before the Notice of Award is given request apparent Successful Bidder to submit an acceptable substitute without an increase in Proposal price.

If apparent Successful Bidder declines to make any such substitution, Construction Manager may award contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. Any Subcontractor, Supplier, other person or organization listed and to whom Construction Manager does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Construction Manager subject to revocation of such acceptance after the Effective date of the Agreement as

provided in Paragraph 6.8.2 of the General Conditions.

12. Proposal Form

The Proposal Form is included with the Proposal Documents; additional copies may be obtained from the Construction Manager.

Any additional items written into the form will not be considered in the Proposal.

All blanks on the Proposal Form must be completed by printing in black ink or by typewriter.

Attach scope sheet to the Proposal Forms for clarifications of work performed. Proposal forms and any additional information must be included in a sealed envelope marked with Proposer's name and address and identified as "**City of La Joya New City Hall and Public Safety Building**".

Proposals by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign).

Proposals by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed in black ink below the signature.

The Proposal shall contain an acknowledgement of receipt of all Addenda the numbers of which must be filled in on the Proposal Form.

The address and telephone number of communications regarding the Proposal must be shown.

Evidence of authority to conduct business as an out-of-state corporation in the State of Texas where the Work is to be performed shall be provided in accordance with above.

13. Submission of Proposals

Proposals shall be submitted at the time and place indicated in the "Proposal Form" and shall be enclosed in an opaque sealed envelope, marked with the Project title, and name and address of Bidder. If the Proposal is sent through mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation "PROPOSAL ENCLOSED: on the face of it.

14. Modifications and Withdrawal of Proposals

Proposals may be modified or withdrawn by an appropriate document duly executed (in a manner that a Proposal must be executed) and delivered to the place where Proposals are to be submitted at any time prior to the opening of Proposals.

All Proposals opened and read aloud will not be withdrawn or modified.

15. Proposals to Remain Subject to Acceptance

All Proposals will remain subject to acceptance for forty-five (45) days after the day of the Proposal opening, but Construction Manager may, in its sole discretion, release any Proposal prior to that date.

16. Award of Contract

Construction Manager reserves the right to reject any of all Proposals, including without limitation the rights to reject any or all nonconforming, non-responsive, unbalanced or conditional Proposals and to reject the Proposal of

any Bidder if Construction Manager believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because of the Proposal is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Construction Manager. Construction Manager also reserves the right to waive all informalities not involving price, time or changes in Work and to negotiate contract terms with the Successful Bidder. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

In evaluating Proposals, Construction Manager will consider the qualifications of Bidders, whether or not the Proposals comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Proposal Form or prior to the Notice of Award.

Construction Manager may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Construction Manager may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to Notice of Award.

If contract is to be awarded, it will be awarded to the Bidder whose evaluation by Construction Manager indicates to Construction Manager that the award will be in the best interests of the Project.

If the contract is to be awarded, Construction Manager will give Successful Bidder a Notice of Award within forty-five (45) days after the day of the Proposal opening.

17. Signing of Agreement

When Construction Manager gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen (15) days thereafter Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Construction Manager. Thereafter Construction Manager shall deliver three (3) fully signed counterparts to Contractor, during the Pre-construction Conference. Each counterpart is to be accompanied by a complete set of Drawings with appropriate identification.

18. Sales and Use Taxes

The Bidder's attention is directed to the State of Texas Comptroller of Public Accounts Limited Sales Excise and Use Tax Rules and Regulations, paragraph 3, of Ruling No.9, Repairmen and Contractors (amended April 3, 1972). Reference Article 20.01 (T). Upon compliance with certain conditions this ruling provides for exemption for this tax of materials incorporated into work done for an exempt agency under a contract. The Owner is an exempt agency.

Any Bidder may elect to exclude this sales tax from his Proposal. If the Bidder submitting the lowest acceptable Proposal for performing the Work on this Project elects to comply with the above ruling on any item included in this contract by obtaining any necessary permit or permits from the State of Comptroller allowing the purchase of material incorporation into this Project without having to pay the Limited Sales, Excise and Use Tax at the time of purchase, Bidder shall upon award of contract, submit statement in satisfactory form in which his Proposal prices to the Owner for materials are listed separately from all other charges, either by Proposal item or by total as required by the Comptroller. This statement shall be included in and made a part of the contract.

The Owner will furnish the Bidder with its exemption certificate for those materials incorporated in the project for which the above required statement is submitted.

The Owner will make no further allowance for and will make no price adjustment above or below the originally Proposal unit price on account of tax. It shall be the Bidder's sole responsibility, if he/she elects to exclude the sales tax from his/her Proposal, to comply with the aforementioned ruling No. 9 and with any other applicable rules,

regulations, or laws pertaining to the Texas Limited Sales, excise and Use Tax which may now or at any time during the performance of this contract be in effect, and the Owner shall have no responsibility for any sales or use tax which the Bidder may be required to pay as the result of his failure or the Owner's failure to comply with said rules, regulations or laws, or as the result of the performance of the contract or any part thereof by the Bidder.

Bidders are cautioned that materials, which are not permanently incorporated into the work, are not eligible for exemption and are not to be included in the statement as "Materials" (example: fuels, lubricants, tools, forming materials, etc.).

19. Guarantee

The Bidder shall guarantee the work for a period of one (1) year after date of acceptance in writing by the Construction Manager. During this period, the Contractor shall make any repairs and/or replacements of defective materials and corrections due to poor workmanship, all as may be required for full compliance with the Contract Documents. This guarantee shall apply to all matters reported by the Construction Manager in writing within the said one (1) year period.

20. Documents

Subcontractors may obtain one (1) set of Drawings and Project Manuals from the office: RGV REPROGRAPHICS, 519 S. BROADWAY ST., McAllen, Texas 78501 (956) 686-1525

A deposit of **TWO HUNDRED DOLLARS ($200.00)** will be required for each set of Drawings and Project Manuals issued. Partial sets will not be issued. Make checks payable to Holchemont Ltd.

Deposits will be refunded to offerors and subcontractors provided that all sets are returned to the Construction Manager within ten {10} days after date of opening of Proposals. The offeror awarded the Project may retain the Construction Documents, and his deposit will be refunded upon execution of the Contract.

Complete sets of Drawings and Project Manuals are on file at the following locations and subcontractors may examine them there:

-A.G.C. PLAN ROOMS, (McAllen, Harlingen, Brownsville)
-DODGE REPORTS (Online)
-BUILDERS EXCHANGE OF TEXAS (Online)

SECTION 00150 — TAX EXEMPT ORGANIZATION CERTIFICATE

PART 1 - GENERAL

1.1 DEFINITION

A. This Contract is to be performed for an exempt organization as defined by Title 2; Subtitle E; Chapter 150 of the Texas Limited Sales, Excise and Use Tax Act and Section 151.311 of the State Statutes. The Owner will furnish the Contractor proof or Certificate of Exemption upon award of contract.

B. Bidders shall not include sales tax in their Bid.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PROPOSAL FORM

To: Construction Manager at Risk: Holchemont Ltd.

Project: City of La Joya - New City Hall & Public Safety Building

Place: Holchemont Ltd.
900 North Main St.
McAllen, Texas 78501

Date: **February 07, 2017**

Time: **4:00 P.M.**

Proposal
Submitted by: _____

BASE PROPOSAL:

$_____ (Base proposal number)

$_____ (Base proposal words)

ALTERNATE #1 (Existing Coping):

$_____ (Alt.#1 proposal number)

$_____ (Alt. #1 proposal words)

ALTERNATE #2 (Extended mechanical warranty):

$_____ (Alt.#2 proposal number)

$_____ (Alt. #2 proposal words)

ALTERNATE #3 (Replace existing lights):

$_____ (Alt.#3 proposal number)

$_____ (Alt. #3 proposal words)

Divisions and Sections Bidding:_____

_____

P&P Bond for Mechanical, Plumbing and Electrical Only (ADD): _____

_____($_____)

This offer shall not be modified, withdrawn or cancelled for a period of forty-five (45) days from proposal closing date. Please attach company proposal.

Receipt is acknowledged of the follow addenda:

Addendum No._____ Dated: _____
Addendum No._____ Dated: _____
Addendum No._____ Dated: _____
Addendum No._____ Dated: _____

Respectfully Submitted,

By: _____
Signature of Authorized Officer

Type Name: _____

Title: _____

Address: _____

_____

Telephone: _____

MEG GEOTECHNICAL ENGINEERING REPORT

PROPOSED
NEW PUBLIC SAFETY BUILDING ADDITION

LA JOYA, HIDALGO COUNTY, TEXAS

Millennium Engineers Group
MEG ENGINEERS
Consultants - Geotechnical - Testing

2001 MILLENNIUM ENGINEERS GROUP, INC. 10th ANNIVERSARY 2011 EDINBURG, TX

Geotechnical Engineering
Construction Materials Testing
Consulting Engineering
Forensics

GEOTECHNICAL ENGINEERING STUDY
FOUNDATION RECOMMENDATIONS
PROPOSED NEW PUBLIC SAFETY BUILDING ADDITION
LA JOYA, HIDALGO COUNTY, TEXAS

Prepared For
Mr. Mike Alaniz, City Administrator
City of La Joya

MEG Report No. 01-15-29198

October 21, 2015

MILLENNIUM ENGINEERS GROUP, INC.
TBPE FIRM NO. F-3913
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL:956-702-8500
FAX:956-702-8140

October 21, 2015

Mr. Mike Alaniz, City Administrator
City of La Joya
c/o Milnet Architecture Services
608 S. 12th Street
McAllen, Texas 78501

Subject: **Geotechnical Engineering Study**
MEG Report No. 01-15-29198
Foundation Recommendations
Proposed New Public Safety Building Addition
La Joya, Hidalgo County, Texas

Dear Mr. Alaniz:

Millennium Engineers Group, Inc. is pleased to submit the enclosed geotechnical engineering report that was prepared for the above subject project. This report addresses the procedures and findings of our geotechnical engineering study. Our recommendations should be incorporated into the design and construction documents for the proposed development. Please consult with us, as needed, during the design and construction process.

We want to emphasize that our firm be retained to ensure that actual field conditions are those described in our geotechnical report. We cannot over emphasize the importance that all our recommendations presented in this report and/or addendums to this report be followed. We look forward to continuing our involvement in the project by providing construction monitoring in accordance with the report recommendations and materials testing services during construction. We strongly recommend that we be a part of the preconstruction meeting to address any specific issues that are pertinent to this project.

Thank you for the opportunity to be of service to you in this phase of the project and we would like the opportunity to assist you in the upcoming phases of the project. If you have any questions, please contact our office at the address, telephone, fax or electronic address listed below.

STATE OF TEXAS
RAUL PALMA
65656
LICENSED
PROFESSIONAL ENGINEER
10/21/15

Cordially,
Millennium Engineers Group, Inc.
TBPE Firm No. F-3913

Raul Palma, P.E.
President

Cc: 2 Originals and PDF Document

TABLE OF CONTENTS

APPENDIX

1.0 INTRODUCTION

Millennium Engineers Group, Inc. (MEG) has completed and is pleased to submit this document that presents our findings as a result of a geotechnical engineering study of this project to our client. The project site is located at the northeast corner of the intersection of Expressway 83 and N. Coyote Drive in La Joya, Hidalgo County, Texas. The project location is shown on the Project Location Map, found in the Appendix section of this report. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendation, for foundation design and construction considerations.

Our scope of services for the project was outlined in MEG proposal No. 01-15-240G, dated October 1, 2015.

2.0 PROJECT DESCRIPTION

It is our understanding that the proposed site will accommodate the construction of additions to the new public safety building. It is also our understanding that the proposed site additions will consist of a one story structure. The site construction for the proposed structure is anticipated to be on a slab-on-grade or on-fill foundation provided expansive, soil-related movements will not impair the performance of the structure.

3.0 SCOPE AND LIMITATIONS OF STUDY

This engineering report has been prepared in accordance with accepted geotechnical engineering practices currently exercised by geotechnical engineers in this area. No warranty, expressed or implied, is made or intended. This report is intended for the exclusive use by the client and client's authorized project team for use in preparing design and construction documents for this project only. This report may only be reproduced in its entirety for inclusion in construction documents. This report in its entirety shall not be reproduced or used for any other purposes without the written consent of our firm. This report may not contain sufficient information for purposes of other parties or other uses and is not intended for use in determining construction means and methods.

The recommendations presented in this report are based on data obtained from the soil borings drilled at this site and our understanding of the project information provided to us by our client and other project team members, and the assumption that site grading will result in only minor changes in the existing topography. Subsurface soil conditions have been observed and interpreted at the boring locations only.

This report may not reflect the actual variations of the subsurface conditions across the subject site. It is important to understand that variations may occur due to real geologic conditions or previous uses of the site. The nature and extent of variations across the subject site may not become evident until specific design locations are identified and/or

construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time during the design phase and/or construction phase, we should be notified immediately to determine if our opinions, conclusions and recommendations need to be reevaluated. It may be necessary to perform additional field and laboratory tests and engineering analyses to establish the engineering impact of such variations. These services are additional and are not a part of our project scope.

The engineering report was conducted for the proposed project site described in this report. The conclusions and recommendations contained in this report are not valid for any other project sites. If the project information described in this report is incorrect, is altered, or if new information becomes available, we should be retained to review and modify our recommendations. These services are additional and are not a part of our project scope.

Our scope of services was limited to the proposed work described in this report, and did not address other items or areas. The scope of our geotechnical engineering study does not include environmental assessment of the air, soil, rock or water conditions on or adjacent to the site. No environmental opinions are presented in this report. If the client is concerned with environmental risk at this project site, the client should perform an environmental site assessment.

If final grade elevations are significantly different from existing grades at the time of our field activities (more than plus or minus one (1) foot), our office should be informed about these changes. If desired, we will reexamine our analyses and make supplemental recommendations.

4.0 FIELD EXPLORATION PROCEDURES

Subsurface conditions at the subject site were evaluated by three (3) 20 foot soil borings. The Borings were drilled at the locations shown on the Borings Location Map, found in the Appendix section of this report. This location is approximate and distances were measured using a measuring wheel, tape, angles, and/or pacing from existing references. The structural soil borings were drilled in general accordance with American Society of Testing Materials (ASTM) D 420 procedures.

As part of our sampling procedures, the samples were collected in general conformance with ASTM D 1586 procedures. Representative portions of the samples were sealed in containers to reduce moisture loss, identified, packaged, and transported to our laboratory for subsequent testing. In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff. The geotechnical engineering properties of the strata were evaluated by a series of laboratory tests. The results of the laboratory and field-testing are tabulated on the boring logs and Summary of Soil Sample Analyses which are found in the Attachments section of this report.

Standard penetration test results are noted on the boring logs as blows per 12 inches of penetration. Two 6 inch increments are performed for each standard penetration test.

The sum of the blows for the two 6 inch increments is considered the “standard penetration resistance value” or “N-value.” Where hard or very dense materials were encountered, the tests are terminated as follows: (1) when a total of 50 blows have been applied in any of the 6 inch increments, or (2) when a total of 100 blows have been applied, or (3) when there is no observed advance of the sampler in the application of 10 successive blows. The boring logs in the case of hard or very dense materials will be noted as follows: 50/3”, where 50 is the number of blows applied in 3 inches of penetration, or 100/7½” where 100 is the number of blows applied in a total of 7 ½ inches of penetration, or 10/0”, where 10 is the number of blows applied in 0 inches of penetration.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

5.0 GENERAL SITE CONDITIONS

5.1 Site Description

The project site is located at the northeast corner of the intersection of Expressway 83 and N. Coyote Drive in La Joya, Hidalgo County, Texas.. The project location is shown on the Project Location Map, found in the Appendix section of this report. At the time of our field operations, the subject site can be described as a developed tract of land. The general topography of the site is relatively flat sloping down to the west with a visually estimated vertical relief of less than 3 feet. Surface drainage is visually estimated to be poor to fair.

5.2 Site Geology

According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture – Soil Conservation Service, the project site appears to be located within the McAllen soil association. The McAllen series consist of deep, well drained, loamy nearly level soil is on convex uplands. These soils formed in calcareous loamy sediments partly reworked by wind. The soil is well drained, surface runoff is medium and permeability is moderate. Slopes range from 0 to 5 percent. Areas are broad irregular in shape and range from 25 to more than 350 acres in size. The corresponding soil symbol is 35, McAllen fine sandy loam, 0 to 1 percent.

5.3 Subsurface Conditions

On the basis of our borings, four (4) generalized strata that possess similar physical and engineering characteristics can describe the subsurface stratigraphy at this site. Table 1 summarizes the approximate strata range in our boring logs. These were prepared by visual classification and were aided by laboratory analyses of selected soil samples. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual details for each of the borings can be found on the boring logs in the appendix of this report.

Table 1. Approximate Subsurface Stratigraphy Depths.

Stratum	Range in Depth, ft[1]	Stratum Description[1]
I	0 – 4	clayey SAND to sandy lean CLAY, dk. brown w/ traces of white nodules, dry to moist, very stiff to med. stiff
II	4 – 6	sandy lean CLAY, brown, moist, med. stiff to stiff
III	6 – 12	sandy fat CLAY, brown w/ traces of white nodules, moist, stiff to hard
IV	12 – 20	fat CLAY with sand, brown w/ traces of white nodules, moist, hard

Note 1: The stratum thickness and depths to strata interfaces are approximate. Our measurements are rounded off to the nearest foot increment and are referenced from ground surface at the time of our drilling activities. Subsurface conditions may vary between the boring locations.

5.4 Groundwater Conditions

The dry auger drilling technique was used to complete the soil borings in an attempt to observe the presence of subsurface water. During our drilling operations we did not encounter groundwater for short term conditions at this project site. Table 2 summarizes the approximate groundwater and cave in depths measured in our explorations. It should be noted that the groundwater level measurements recorded are accurate only for the specific dates on which measurement were obtained and does not show fluctuations throughout the year.

Fluctuations in Groundwater levels are influenced by variations in rainfall and surface water run-off from season to season. The construction process itself may also cause variations in the groundwater level. If the subsurface water elevation is critical to the construction process the contractor should check the subsurface water conditions just prior to construction excavation activities.

Table 2. Approximate Groundwater and Cave-in Depths.

Boring No.	Depth to Subsurface Water, Ft	Depth to Cave-In, Ft	Subsurface Water Observation Period, Hrs
B-1	N/A	18	1
B-2	N/A	18	1
B-3	N/A	18	1

Note 1: Subsurface water levels and cave-in depths have been rounded to the nearest foot.
Note 2: Subsurface water levels and cave-in depths recorded after the completion of bore holes.
Note 3: Items marked N/A were not encountered during drilling operations.

Based on the findings in our borings and on our experience in this region, we believe that groundwater seepage is unlikely to be encountered during site earthwork activities. If groundwater seepage is encountered during site earthwork activities it may be

controlled using temporary earthen berms and/or conventional sump-and-pump dewatering methods.

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.1 General

The analysis and recommendations presented in this report are applicable specifically to the proposed foundation structure. The data gathered from both the field and laboratory testing programs on soil samples obtained from the borings was utilized to establish geotechnical engineering parameters to develop recommendations for the proposed structure. The foundation system(s) considered in this report to provide support for the proposed structure must meet two independent criteria. One of the criteria is that the movement below the foundation structure due to compression (consolidation) or expansion (swell) of the underlying soils must be within tolerable limits. This criterion is addressed in the Soil Related Movements section of this report. The other criterion is that the dead and live loads must be distributed appropriately and the foundation structure designed with an acceptable factor of safety to minimize the potential for bearing capacity failure of the underlying soils.

Geotechnical and structural engineers in this general area consider soil movements or Potential Vertical Rise (PVR) of approximately one (1) inch or less to be within acceptable structural design tolerances for most structures but may be different depending on structure use and the desired performance of the foundation. Therefore, movements of the underlying soils are not eliminated and thus one should expect a slab foundation structure to exhibit differential vertical movements. However, structural engineers design slab foundations for the expected magnitude of soil movements without failure of the structure. More stringent soil movement criteria may be established but the owner should consider the exponential increase in cost required to design and construct a structure for such soil movements. Data obtained in this study indicate that the soils at this site have strength characteristics capable of supporting the foundation and structure if designed appropriately. Stratum I is composed of clayey sand to sandy lean clay and has a low to moderate potential to exhibit volumetric changes (contraction and expansion). Stratum II is composed of sandy lean clay and has a moderate potential to exhibit volumetric changes. Stratum III is composed of sandy fat clay and has a high potential to exhibit volumetric changes. Stratum IV is composed of fat clay with sand and has a high potential to exhibit volumetric changes. The potential for soil volumetric changes is dependent on variations in moisture contents of the underlying soils. Based on this data, this site is suitable for a slab foundation provided the subgrade is modified in accordance with the recommendations established in this report to reduce the potential for these soil volumetric changes.

6.2 Soil-Related Movements

The anticipated ground movements due to swelling of the underlying soils at this site were estimated for slab foundation construction using the Texas Department of Transportation (TxDOT) procedures of test method TEX-124-E for determining Potential

Vertical Rise (PVR). A PVR value of two and a half (2 1/2) inches was estimated for the stratigraphic conditions encountered in our subsurface borings. A surcharge of 1 pound per square inch for the concrete slab, an active zone of 15 feet, and dry subsurface moisture conditions were assumed in estimating the above PVR values.

The following methods are generally acceptable for use in modifying the subgrade to reduce the potential for soil movements and volumetric changes below the foundation structure.

Excavate expansive clay soils and replace with select fill.
Chemical injection of expansive clay soils.
A combination of methods 1 and 2.

The method to be used is dependent on specific site conditions. At this site the grade will most likely need to be raised to obtain the proposed Finished Floor Elevation (FFE). As of the date of this report the CLIENT/OWNER has not provided the proposed FFE. We recommend that the project civil engineer evaluate the proposed FFE with our recommendations to ensure that the subgrade modifications presented in the report are not diminished or compromised. Adding select fill is generally the most cost effective method for reducing the potential for soil related movements. Therefore, we only discuss this method in this report but we can provide details for the other methods if requested.

Based on the data obtained, the proposed FFE, information provided by our client and our analysis of the site, we recommend the following modification (Table 3. Subgrade Modifications) of the subgrade at this area to accomplished finish floor elevation of the subgrade at this site. This method will maintain the potential for soil related movements to an approximate PVR value of less than one (1) inch, which is generally desired for projects of this type.

Table 3. Subgrade Modifications

Item	Description
1	See and adhere to the Site Preparation Recommendations section of this report.
2	Excavate existing soils to a depth of three and a half (3 1/2) feet below natural ground elevation in accordance with the Site Preparation Recommendations section of this report.
3	Condition and compact twelve (12) inches of subgrade below excavated soils in accordance with the Site Preparation Recommendations section of this report.
4	Place **select fill,** (up to FFE elevation (a minimum of three and a half (3 1/2) feet of select fill)) condition and compact up to the proposed FFE in accordance with the Select Fill Recommendations section of this report.

The PVR method of estimating expansive, soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive, soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analyses of expansive, soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values as a result of isolated changes in moisture content (such as leaks, landscape watering, etc.) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching and/or excavations.

6.3 Conventional Shallow Slab-on-Grade Foundation Design Criteria

As indicated previously a slab foundation may be used at this site in conjunction with the subgrade modifications listed under the Soils Related Movements section. We recommend the following soil bearing pressures, and dimensional criteria for the slab grade beams. These recommendations ensure proper utilization of soil bearing capacity of continuous beam sections in the slab-on-grade foundation and reduce the potential of water migration from the outside to beneath the slab foundation. For structural considerations the beams may need to be greater and should be evaluated and designed by the structural engineer. Where concentrated load areas are present the grade beams or slab may be thickened and widened to serve as spread footings. Soil bearing pressures and beam dimensional criteria are as follows:

Table 4. Bearing Criteria

Grade Beams and Continuous Footings	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	30 inches
Maximum allowable bearing pressure:	1,600 psf
Spread Footings (square)	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	60 inches
Maximum allowable bearing pressure:	1,900 psf

The above-presented maximum allowable bearing pressures will provide a factor of safety of 3 with respect to the design soil strengths. For a slab foundation structure designed and constructed in accordance with the recommendations of this report, it is anticipated that total settlements will be in the order of one (1) inch or less. If lower

anticipated total settlements are required for this project further mitigation may be required and MEG must be consulted for further recommendations.

Furthermore, the above design parameters are contingent upon the fill materials (if utilized) being selected and placed in accordance with the recommendations presented in the Select Fill Recommendations section of this report. Should select fill selection and placement differ from the recommendations presented herein, MEG should be informed of the deviations in order to reevaluate our recommendations and design criteria.

Excavations for slab on grade and spread footing foundations should be performed relatively clean and with an undisturbed bearing area. The bottom 6 inches of the excavation should be performed using a flat plate excavation bucket. The excavations should be neatly excavated. No foreign debris or undisturbed soil should be left in the footing bottom. Should there be any abundance of foreign debris or disturbed soil found, it may be necessary to re-assess the fill site of its bearing capacity suitability. If the bearing area is found to be disturbed, the bearing area will require preparation and compaction for the entire depth of the disturbance in accordance with the Site Preparation and/or the Select Fill sections of this report.

The bearing surface of the grade beams and spread footings should be evaluated after excavation and immediately prior to concrete placement. We recommend that footing inspections be performed by a representative of MEG. The required inspections shall include inspecting for clean, dry (The moisture content should be within limits specified by the appropriate section in this report.) and undisturbed footing bottom, depth of footing, clearances from sides and size and spacing of reinforcing steel. Test results shall comply with the recommendations of this geotechnical report and shall be verified by an on-site representative of MEG.

Over excavation, if necessary, for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of over excavation depth below footing base elevation. The over excavation should then be backfilled up to the footing base elevation select fill placed in lifts of 8 inches or less in loose thickness and prepared and compacted in accordance with the Site Preparation and/or the Select Fill sections of this report. Equipment should not be operated and materials should not be placed or stockpiled within a horizontal distance equal to the excavation depth from the edge of the excavation. Excavations should not be placed next to existing structures or buried utilities/structures closer than a horizontal distance equal to the excavation depth unless some form of protection for the facilities is provided.

Water should not be allowed to accumulate at the bottom of the foundation excavation. Proper barriers such as berms or swales should be placed to divert any surface runoff away from excavations. To reduce the potential for groundwater seepage into the excavations and to minimize disturbance to the bearing area, we recommend that steel and concrete be placed as soon as possible after the excavations are completed, properly prepared and cleaned. Excavations should not be left open overnight.

6.4 BRAB Design Criteria for Slab-on-Grade Foundations

Table 5 list the values for criteria developed by the Building Research Advisory Board (BRAB) for the design of shallow slab-on-grade foundations. On the basis of stratigraphy encountered and the anticipated site modifications discussed earlier, the design criteria are as follows:

Table 5. BRAB Values

For Existing Conditions	
Effective Plasticity Index	34
Climatic Rating Cw.	15
Soil Support Index, (c)	0.79
For Proposed Conditions	
Effective Plasticity Index	29
Climatic Rating Cw.	15
Soil Support Index, (c)	0.84

Note 1: Subgrade Modifications as outlined in the recommendations of this report;

7.0 CONSIDERATIONS DURING CONSTRUCTION

7.1 Site Grading Recommendations

Site grading plans can result in changes in almost all aspects of foundation recommendations. We have prepared the foundation recommendations based on the existing ground surface; there is no surcharge addition for the stratigraphic conditions encountered at the time of our study. If site grading plans differ from existing grades by more than plus or minus 1 foot, we must be retained to review the site grading plans prior to bidding the project for construction. This will enable us to provide input for any changes in our original recommendations that may be required as a result of site grading operations or other considerations.

7.2 Site Drainage Recommendations

Drainage is one of the most important aspects to be addressed to ensure the successful performance of any foundation. Positive surface drainage should be implemented prior to, during and maintained after construction to prevent water ponding at or adjacent to the building facilities. It is recommended that the building and site design include rain gutters, downspouts and concrete gutters to channel runoff to paving or storm drains.

7.3 Site Preparation Recommendations

Building areas and all area to support select fill should be stripped of all vegetation and organic topsoil up to a minimum of 5 ft beyond the building perimeters. After stripping, remove at least six (6) inches of on-site soil as measured from existing grade when excavation of existing subgrade is not recommended in other sections of this report. The excavated material, if free of organic and/or deleterious material, may be stockpiled for use in the non-structural areas of the site. Where excavation of the subgrade is recommended in this report, the bottom of the excavation will extend at least five (5) feet beyond the limits of the planned building perimeter including canopies and sidewalks. Exposed subgrades should be thoroughly proof rolled in order to locate and compact any weak, compressible and soft spots. Proof rolling shall be in accordance with TxDOT 2014 Specification Item 216. Proof rolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proof rolling or areas where large tree roots have been removed within the limits of excavation should be removed and replaced with a suitable, compacted select fill in accordance with the recommendations presented under the Select Fill Recommendations section of this report. Proof rolling operations and any excavation/backfill activities should be observed by **MEG** representatives to document subgrade preparation.

Prior to fill placement, the exposed subgrade shall be prepared based on what option is selected from the foundation and pavement recommendations. The exposed subgrade should be prepared, moisture-conditioned by scarifying to a minimum depth as recommended in the foundation and pavement recommendations and recompacting to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698, moisture-density relationship. The moisture content of the subgrade should be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The soil should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.4 Select Fill Recommendations

Materials used for select fill shall meet the following requirements:

1. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base; Type A, Grades 1 through 3.
2. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Types B or C, Grades 1 through 5 with a minimum plasticity index of 7.
3. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Type E, Grade 4 with a plasticity index between and inclusive of 7 and 15. Type E material shall be defined as Caliche (argillaceous limestone, calcareous or calcareous clay particles) and may contain stone, conglomerate, gravel, sand or granular materials when these materials are in situ with the caliche. Flexible Base (Type E, Grade 4) shall conform to the following requirements:

Table 6. Type D, Grade 6 Requirements

Retained on Sq. Sieve	Percent Retained
2”	0
½”	20-60
No. 4	40-75
No. 40	70-90
Max. PI:	15
Max. Wet Ball PI:	15
Wet Ball Mill Max Amount:	50
Wet Ball Increase, Max Passing No. 40 sieve	20

1. Soils classified according to USCS as SM, SC, GM, GC, CL, ML and combinations of these soils. The soils shall be relatively free of organic matter. In addition to the USCS classification, select materials shall have a liquid limit of less than 40 and a plasticity index between and inclusive of 10 and 17.
2. Soils classified, as CH, MH, OH, OL and PT, under the USCS are not considered suitable for use as select fill materials at this site.

Select fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus three (+3) percentage points above the optimum moisture content until the fill is permanently covered. The select fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.5 Site Fill Recommendations

Site fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The site fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.6 Back Fill Recommendations

Back fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently

covered. The back fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.7 Utility Considerations

Utilities that project through the slab-on-grade, slab-on-fill, floating floor slabs, or any other rigid unit should be designed with some degree of flexibility or with sleeves. Such features will help reduce the risk of damage to utility facilities from soil movements related to shrinkage and expansion.

7.8 Utility Trench Recommendations

Bedding and initial backfill are buried around utility lines to support and protect the utility. The secondary backfill above the initial backfill also helps protect and support the foundation and/or pavement above. To ensure that settlement is not excessive in this secondary backfill we recommend the following:

1) If possible trench and install utilities prior to work such as lime treatment and/or compaction of subgrade or placement of other fills or bases.
2) Place, moisture condition and compact the secondary backfill in accordance with the pertinent project requirements. Within the footprint of a building pad the secondary backfill should meet the same compaction requirements for select fill. Within the footprint of a pavement structure the secondary backfill should meet the same compaction requirements for the subgrade. When compaction of the subgrade is not specified it should meet the same compaction level of the adjacent natural ground. An alternative to compaction of secondary backfill is the use of flowable fill where secondary backfill is to be placed. If properly designed, the flowable fill can be excavated easily at a later date if necessary. No compaction and no testing is required when properly designed flowable fill is used.

7.9 Excavation, Sloping and Benching Considerations

If trenches are to extend to or below a depth of five (5) ft., the contractor or persons doing the trenching should adhere to the current Occupational Health and Safety Administration (OSHA) guidelines on trench excavation safety and protection measures. Other industry standards may be applicable. The collection of specific geotechnical data and development of a plan for trench safety, sloping, benching or various types of temporary shoring, is beyond the scope of the this study.

7.10 Shallow Foundation Excavation Considerations

The Geotechnical Engineer or his representative prior to the placement of reinforcing steel and concrete should observe shallow foundation excavations. This is necessary to verify that the bearing soils at the bottom of the excavations are similar to those encountered during the subsurface soil exploration phase 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 removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevation.

7.11 Landscaping Considerations

Even though landscaping is a vital aesthetic component of any project, the owner, client and design team should be aware that placing trees or large bushes adjacent to any structure may distress the structure in the future. It is recommended that if any landscaping is to be placed adjacent to the structure in this project, it should be limited to small plants and shrubs. Trees and large bushes should be placed at a distance such that at their mature height, their canopy or “drip line” does not extend over the structures. The owner, client and design team should also be aware that if any watering is to be done in connection with the landscaping for this project it should be controlled, consistent and timely. Excessive or prolonged watering is not recommended. If watering is part of the landscaping plan, termination of watering for any extended period of time may also be detrimental to the structure. It is important that the moisture level in the subsurface soils remain constant so that shrinking and swelling of soils may be mitigated.

7.12 Perimeter Foundation Cap

We recommend that a cap of impervious fill be placed around the perimeter of the foundation to mitigate the intrusion of moisture into the soils surrounding the foundation. The top eighteen inches of fill around the foundation structure should be a low permeance clay cap to keep surface water away from the foundation. The low permeance clay cap should be sloped away from the foundation at a minimum slope of 2% and the surrounding areas should have positive drainage. The low permeance clay shall meet the USCS classification of CH or CL with a minimum Plasticity Index of 20 and a minimum of 50% by weight passing the No. 200 sieve. The low permeance clay shall be compacted to minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the subgrade should be maintained within the range of optimum to four (4) percentage points above the optimum moisture. If plantings are intended, add 4 to 6 inches of loam on top of the clay cap.

8.0 PROJECT REVIEW AND QUALITY CONTROL

Each project site is unique and it is important that the appropriate design data, construction drawings, specifications, change orders and related documents be reviewed by the respective design and construction professionals participating in this project. The performance of foundations, construction building pads and/or parking areas for this project will depend on correct interpretation of our geotechnical engineering report and proper compliance of and adherence to our geotechnical recommendations and to the construction drawings and specifications.

It is important that **MEG** be provided the opportunity to review the final design and construction documents to check that our geotechnical recommendations are properly interpreted and incorporated in the design and construction documents. We cannot be responsible for misinterpretations of our geotechnical recommendations if we have not had the opportunity to review these documents. This review is an additional service and not part of our project scope.

MEG should be retained to provide construction materials testing and observation services during all phases of the construction process of this project. As the Geotechnical Engineer of Record, it is important to let our technical personnel provide these services to make certain that our recommendations are interpreted properly and to ensure that actual field conditions are those described in our geotechnical report. Since our personnel are familiar with this project, **MEG**'s participation during the construction phase of this project would help mitigate any problems resulting from variations or anomalies in subsurface conditions, which are among the most prevalent on construction projects and often lead to delays, changes, costs overruns, and disputes. If the client does not follow all of our recommendations presented in this report and/or addendums to this report, the client assumes the responsibility and liability of such actions and will hold our firm harmless and without responsibility and liability for client's actions.

A construction testing frequency plan and budget needs to be developed for the required construction materials engineering and testing services for this project. Before construction, we recommend that **MEG**, the project design team members and the project general contractor meet and jointly develop the testing plan and budget, as well as review the testing specifications as it pertains to this project. **A failure to implement a complete testing plan will negate the recommendations provided in this report.**

MEG looks forward to the opportunity to provide continued support on this project.

APPENDIX

Map Unit Name—Hidalgo County, Texas
(01-15-29198 - Proposed New Public Safety Building Additions)

Map Scale: 1:1,890 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- McAllen fine sandy loam, 0 to 1 percent slopes
- McAllen fine sandy loam, 1 to 3 percent slopes
- Not rated or not available

Soil Rating Lines
- McAllen fine sandy loam, 0 to 1 percent slopes
- McAllen fine sandy loam, 1 to 3 percent slopes
- Not rated or not available

Soil Rating Points
- McAllen fine sandy loam, 0 to 1 percent slopes
- McAllen fine sandy loam, 1 to 3 percent slopes
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hidalgo County, Texas
Survey Area Data: Version 11, Sep 30, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 8, 2015—Feb 18, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Name

Map Unit Name— Summary by Map Unit — Hidalgo County, Texas (TX215)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
35	McAllen fine sandy loam, 0 to 1 percent slopes	McAllen fine sandy loam, 0 to 1 percent slopes	12.1	94.0%
36	McAllen fine sandy loam, 1 to 3 percent slopes	McAllen fine sandy loam, 1 to 3 percent slopes	0.8	6.0%
Totals for Area of Interest			**12.8**	**100.0%**

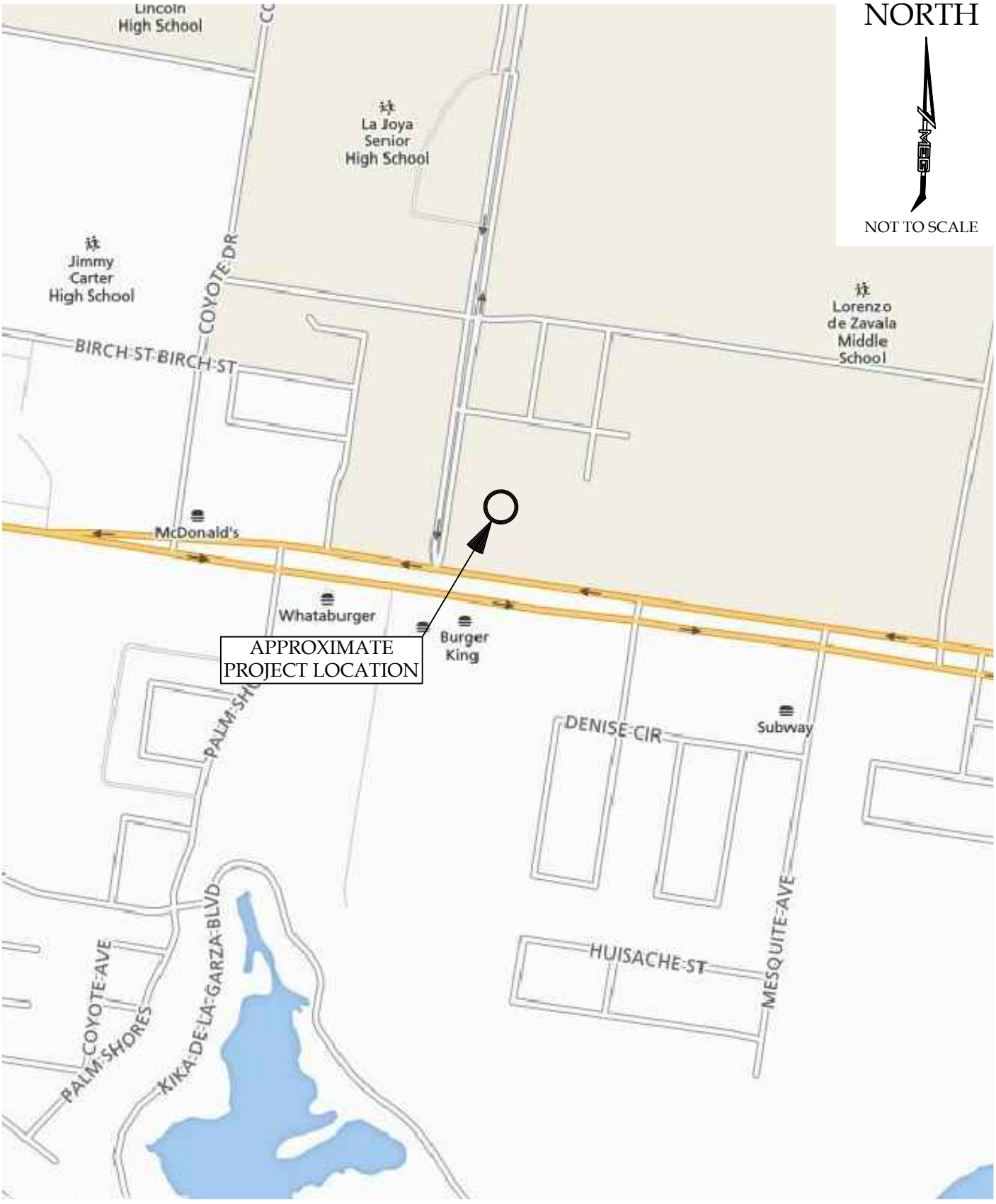
Description

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

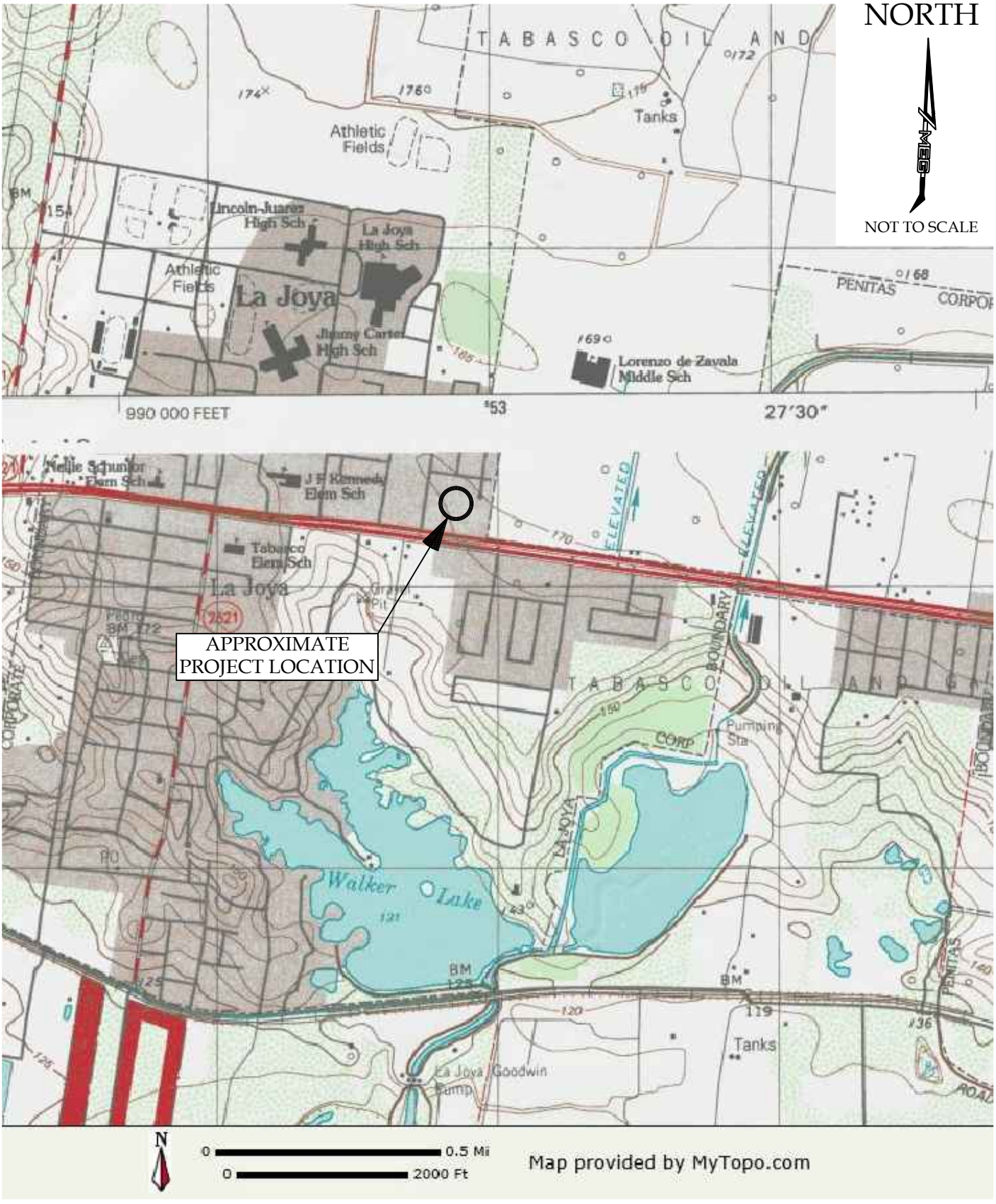


PROJECT SITE LOCATION MAP

PROPOSED NEW PUBLIC SAFETY BUILDING ADDITIONS

LA JOYA, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

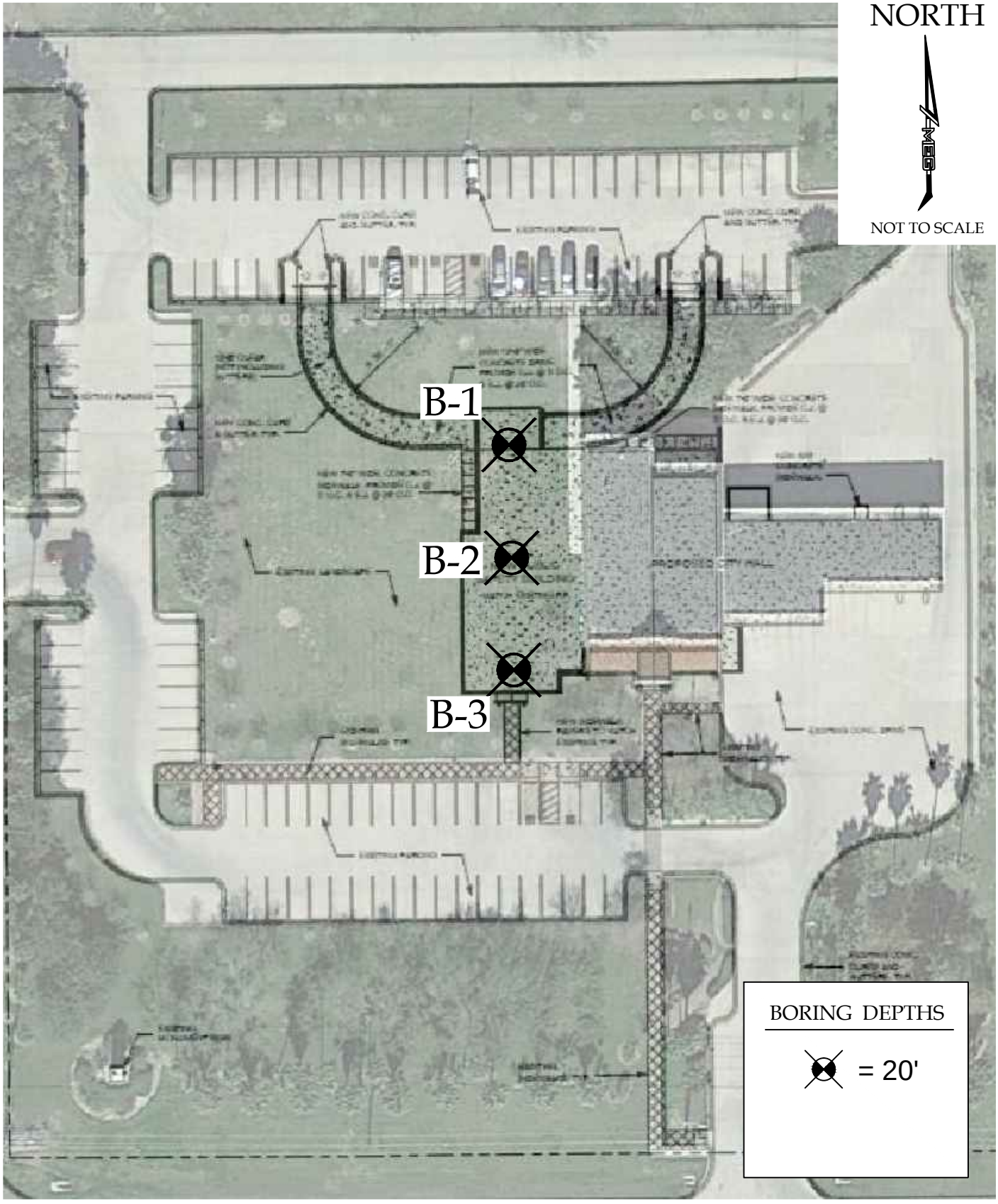


PROJECT TOPOGRAPHIC MAP

PROPOSED NEW PUBLIC SAFETY BUILDING ADDITIONS

LA JOYA, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140



BORING LOCATION PLAN

PROPOSED NEW PUBLIC SAFETY BUILDING ADDITIONS

LA JOYA, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

Project: Proposed New Public Safety Building Additions
Project Location: La Joya, Hidalgo Couty, Texas
Project Number: 01-15-29198

Log of Boring B-1

Sheet 1 of 1

Date(s) Drilled **October 12, 2015**	Logged By **J.P. Palma**	Checked By **R. Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4 in. soil bit**	Total Depth of Borehole **20 feet bgs**
Drill Rig Type **CME 45**	Drilling Contractor **Southwest Drilling**	Approximate Surface Elevation **170 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **2 in. Split Spoon**	Hammer Data **140 lb., 30 in. drop, rope and cathead**
Borehole Backfill **Subgrade**	Location **See Boring Location Map**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	Shear Strength (tsf)	REMARKS AND OTHER TESTS
170	0		1	18		CL		clayey SAND to sandy lean CLAY, dk. brown w/ traces of white nodules, dry to moist, very stiff to med. stiff	8			43	26		
			2	5					8			29	14		
165	5		3	6		CL		sandy lean CLAY, brown, moist, med. stiff to stiff	13		56				
			4	16		CH		sandy Fat CLAY, brown w/ traces of white nodules, moist, stiff to hard	16						
160	10		5	37					15			58	37		
			6	55		CH		fat CLAY w/ sand, brown w/ traces of white nodules, moist, hard	17		84				
155	15														
			7	41					15						
150	20							Bottom of Boring at 20 feet bgs							
145	25														
140	30														
135	35														
130	40														

Z:\MEG FILES\MEG Files\(2) Geotech Department\2015 Geotech\01-15-29198 - City of La Joya Public Service Building\Report Files\7 - Boring logs.bgs [Pocket Pen.tpl]

MEG ENGINEERS

Figure

Project: Proposed New Public Safety Building Additions
Project Location: La Joya, Hidalgo Couty, Texas
Project Number: 01-15-29198

Log of Boring B-2

Sheet 1 of 1

Date(s) Drilled **October 12, 2015**	Logged By **J.P. Palma**	Checked By **R. Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4 in. soil bit**	Total Depth of Borehole **20 feet bgs**
Drill Rig Type **CME 45**	Drilling Contractor **Southwest Drilling**	Approximate Surface Elevation **170 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **2 in. Split Spoon**	Hammer Data **140 lb., 30 in. drop, rope and cathead**
Borehole Backfill **Subgrade**	Location **See Boring Location Map**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	Shear Strength (tsf)	REMARKS AND OTHER TESTS
170	0		1	15		CL		clayey SAND to sandy lean CLAY, dk. brown w/ traces of white nodules, dry to moist, very stiff to med. stiff	5		45				
			2	6					12			28	13		
165	5		3	7		CL		sandy lean CLAY, brown, moist, med. stiff to stiff	13						
			4	14		CH		sandy Fat CLAY, brown w/ traces of white nodules, moist, stiff to hard	15			52	34		
160	10		5	51					14		62				
			6	72		CH		fat CLAY w/ sand, brown w/ traces of white nodules, moist, hard	15						
155	15														
			7	57					18			71	46		
150	20							Bottom of Boring at 20 feet bgs							
145	25														
140	30														
135	35														
130	40														

Figure

Project: Proposed New Public Safety Building Additions
Project Location: La Joya, Hidalgo Couty, Texas
Project Number: 01-15-29198

Log of Boring B-3

Sheet 1 of 1

Date(s) Drilled **October 12, 2015**	Logged By **J.P. Palma**	Checked By **R. Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4 in. soil bit**	Total Depth of Borehole **20 feet bgs**
Drill Rig Type **CME 45**	Drilling Contractor **Southwest Drilling**	Approximate Surface Elevation **170 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **2 in. Split Spoon**	Hammer Data **140 lb., 30 in. drop, rope and cathead**
Borehole Backfill **Subgrade**	Location **See Boring Location Map**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	Shear Strength (tsf)	REMARKS AND OTHER TESTS
170	0		1	31		CL		clayey SAND to sandy lean CLAY, dk. brown w/ traces of white nodules, dry to moist, very stiff to med. stiff	6			44	29		
			2	21					6		37				
165	5		3	11		CL		sandy lean CLAY, brown, moist, med. stiff to stiff	8			38	27		
			4	18		CH		sandy Fat CLAY, brown w/ traces of white nodules, moist, stiff to hard	14		57				
160	10		5	24					15						
			6	49		CH		fat CLAY w/ sand, brown w/ traces of white nodules, moist, hard	18			62	46		
155	15														
			7	88/10"					15		80				
150	20							Bottom of Boring at 20 feet bgs							
145	25														
140	30														
135	35														
130	40														

Figure

Project: Proposed New Public Safety Building Additions
Project Location: La Joya, Hidalgo Couty, Texas
Project Number: 01-15-29198

Key to Log of Boring

Elevation, feet	Depth, feet	Sample Type	Sample Number	Sampling Resistance, blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Unit Weight, pcf	Percent Fines	LL, %	PI, %	Shear Strength (tsf)	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

COLUMN DESCRIPTIONS

1. **Elevation, feet:** Elevation (MSL, feet)
2. **Depth, feet:** Depth in feet below the ground surface.
3. **Sample Type:** Type of soil sample collected at the depth interval shown.
4. **Sample Number:** Sample identification number.
5. **Sampling Resistance, blows/foot:** Number of blows to advance driven sampler foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. **Relative Consistency:** Relative consistency of the subsurface material.
7. **USCS Symbol:** USCS symbol of the subsurface material.
8. **Graphic Log:** Graphic depiction of the subsurface material encountered.
9. **MATERIAL DESCRIPTION:** Description of material encountered. May include consistency, moisture, color, and other descriptive text.
10. **Moisture Content, %:** Water content of the soil sample, expressed as percentage of dry weight of sample.
11. **Dry Unit Weight, pcf:** Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
12. **Percent Fines:** The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
13. **LL, %:** Liquid Limit, expressed as a water content
14. **PI, %:** Plasticity Index, expressed as a water content
15. **Shear Strength (tsf):** Unconfined Compressive Strength
16. **REMARKS AND OTHER TESTS:** Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

TYPICAL MATERIAL GRAPHIC SYMBOLS

- Well graded GRAVEL (GW)
- Well graded GRAVEL with Silt (GW-GM)
- Poorly graded GRAVEL with Silt (GP-GM)
- Silty GRAVEL (GM)
- Clayey GRAVEL (GC)
- Well graded SAND (SW)
- Poorly graded SAND (SP)
- Well graded SAND with Silt (SW-SM)
- Well graded SAND with Clay (SW-SC)
- Poorly graded SAND with Silt (SP-SM)
- Poorly graded SAND with Clay (SP-SC)
- Silty SAND (SM)
- Clayey SAND (SC)
- SILT, SILT w/SAND, SANDY SILT (ML)
- SILT, SILT w/SAND, SANDY SILT (MH)
- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- SILT, SILT with SAND, SANDY SILT (ML-MH)
- CLAY to Fat CLAY w// SAND (CL-CH)
- SILTY CLAY (CL-ML)
- Lean CLAY/PEAT (CL-OL)
- Fat CLAY/SILT (CH-MH)
- Silty SAND to Sandy SILT (SM-ML)
- Silty SAND to Sandy SILT (SM-MH)
- Clayey SAND to Sandy CLAY (SC-CL)
- Clayey SAND to Sandy CLAY (SC-CH)
- Silty to Clayey SAND (SM-SC)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- 2 in. Split Spoon
- 2.5-inch-OD Modified California w/ brass liners
- 3-inch-OD California w/ brass rings
- Shelby Tube (Thin-walled, fixed head)
- Grab Sample
- Bulk Sample
- Pitcher Sample
- Other sampler now modified

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting a given time)
- Minor change in material properties within a stratum
- Inferred or gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

MEG ENGINEERS

Z:\MEG FILES\MEG Files\(2) Geotech Department\2015 Geotech\01-15-29198 - City of La Joya Public Service Building\Report Files\7 - Boring logs.bgs [Pocket Pen.tpl]

Summary of Soil Sample Analyses

Project Name: Proposed New Public Safety Building Additions

Boring No.	Sample Depth (Ft)	Blows per ft	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	-200% Sieve	Shear Strength (tsf)	Dry Unit Weight (pcf)	USCS
B-1	.5 - 2	18	8	43	17	26				CL
	2.5 - 4	5	8	29	15	14				CL
	4.5 - 6	6	13				56			
	6.5 - 8	16	16							
	8.5 - 10	37	15	58	21	37				CH
	13.5 - 15	55	17				84			
	18.5 - 20	41	15							
B-2	.5 - 2	15	5				45			
	2.5 - 4	6	12	28	15	13				CL
	4.5 - 6	7	13							
	6.5 - 8	14	15	52	18	34				CH
	8.5 - 10	51	14				62			
	13.5 - 15	72	15							
	18.5 - 20	57	18	71	25	46				CH
B-3	.5 - 2	31	6	44	15	29				CL
	2.5 - 4	21	6				37			
	4.5 - 6	11	8	38	11	27				CL
	6.5 - 8	18	14				57			
	8.5 - 10	24	15							
	13.5 - 15	49	18	62	16	46				CH
	18.5 - 20	88/10”	15				80			

Laboratory and Field Test Procedures

Soil Classification Per ASTM D2487-93:

This soil-testing standard was used for classifying soils according to the Unified Soil Classification System. The soil classifications of the earth materials encountered are as noted in the attached boring logs.

Soil Water Content Per ASTM D2216-92:

This test determines the water content of soil or rock expressed as a percentage of the solid mass of the soil. The test results are listed under **MC** in the attached boring logs.

Soil Liquid Limit Per ASTM D4318-93:

The soil Liquid Limit identifies the upper limit soil water content at which the soil changes from a moldable (plastic) physical state to a liquid state. The Liquid Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under **LL** in the attached boring logs.

Soil Plastic Limit Per ASTM D4318-93:

The soil Plastic Limit identifies lower limit soil water content at which the soil changes from a moldable (plastic) physical state to a non-moldable (semi-solid) physical state. The Plastic Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under **PL** in the attached boring logs.

Plasticity Index Per ASTM D4318-93:

This is the numeric difference between the Liquid Limit and Plastic Limit. This index also defines the range of water content over which the soil-water system acts as a moldable (plastic) material. Higher Plasticity Index (PI) values indicate that the soil has a greater ability to change in soil volume or shrink and swell with lower or higher water contents, respectively. The test results are listed under **PI** in the attached boring logs.

Standard Penetration Test (SPT) and Split Spoon Sampler (SS) per ASTM D 1586:

This is the standard test method for both the penetration test and split-barrel (spoon) sampling of soils. This sampling method is used for soils or rock too hard for sampling using Shelby Tubes. The method involves penetration of a split spoon sampler into the soil or rock through successive blows of a 140-pound hammer in a prescribed manner.

Blow Counts (N) per ASTM D 1586:

This is the number of blows required to drive a Split Spoon Sampler by means of a 140 pound hammer for a distance of 12 inches in accordance with the variables stated in the test procedures.

Shelby Tube (ST) per ASTM D 1587:

This procedure is for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of physical properties.

Dry Density (DD) per ASTM D 2937:

This procedure is for the determination of in-place density of soil. The test results are measured in pounds per cubic foot, pcf.

Unconfined Compression Test (Uc) per ASTM D 2166:

This test method covers the determination of the unconfined compressive strength of cohesive soil in the undisturbed, remolded, or compacted condition, using strain-controlled application of the axial load.

Minus No. 200 Sieve per ASTM D 1140:

This test method covers determination of the amount of material finer than a Number 200 sieve by washing. The results are stated as a percent of the total dry weight of the sample.

Pocket Penetrometer (PP):

This test method is an accepted modification of ASTM D 1558 test method for establishing the moisture-penetration resistance relationships of fine-grained soils. The test results are measured in tons per square foot, tsf. The strength values provided by this method should be considered qualitatively.

Rock Quality Designation (RQD):

The measure of the quality of a rock mass defined by adding intact rock core pieces greater than four inches in length by the total length of core advance.

Recovery Ratio (REC):

The Recovery Ratio is equal to the total length of core recovered divided by the total length of core advance.

Boring Logs:

This is a summary of the above-described information at each boring location.

SECTION 01019 — ALLOWANCES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

A. Section 01200 – Price and Payment Procedures.

1.3 CONTINGENCY ALLOWANCE

A. Include in the Contract, a stipulated sum of **Eighty Thousand Dollars, ($80,000.00)** for use upon Architect's instruction.

B. Include in the Contract, a stipulated sum of **Ten Thousand Dollars, ($10,000.00)** for removal and relocation of existing underground utilities as directed by the Architect.

C. Include in the Contract, a stipulated sum of **Eight Thousand Dollars, ($8,000.00)** for new millwork as directed by the Architect.

D. Include in the Contract, a stipulated sum of **Seven Thousand Dollars, ($7,000.00)** for removal of existing palm trees and landscaping as directed by the Architect.

1.4 PROCEDURES FOR MANAGING ALLOWANCES

A. Contractor's costs for Products, delivery, installation, labor, payroll, taxes, bonding, and equipment rental will be included in Construction Change Directives authorizing expenditure of funds from Allowances.

B. Funds will be drawn from Allowances only by Construction Change Directives.

C. At closeout of Contract, funds remaining in Allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01045 — CUTTING AND PATCHING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.3 RELATED SECTIONS

A. Section 01100 – Summary: Work by Owner or by separate Contractors.

B. Section 01120 – Alteration Project Procedures.

C. Section 01600 – Substitution Procedures.

D. Individual Product Specification Sections:
1. Cutting and patching incidental to work of the section.
2. Advance notification to other sections of openings required in work of those sections.
3. Limitations on cutting structural members.

1.4 SUBMITTALS

A. Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

B. Include in request:
1. Identification of Project.
2. Location and description of affected Work.
3. Necessity for cutting or alteration.
4. Description of proposed Work and Products to be used.

5. Alternatives to cutting and patching.
6. Effect on work of Owner or separate Contractor.
7. Written permission of affected separate Contractor.
8. Date and time work will be executed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation.

B. Product Substitution: For any proposed change in materials, submit request for substitution in accordance with Section 01600 – Substitution Procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing Work, assess conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work. Avoid unnecessary or extended exposure to weather of work exposed by cutting. Avoid entrapment of moisture or other deleterious mater between existing substrates and new work.

C. Maintain excavations free of water.

3.3 CUTTING

A. Execute cutting and fitting including excavation and fill to complete the Work.

B. Uncover work to install improperly sequenced work.

C. Remove and replace defective or non-conforming work.

D. Remove samples of installed work for testing when requested.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING AND FILLING IN

A. Execute patching and filling of existing openings to complement adjacent Work.

B. Fit Products together to integrate with other Work.

C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

D. Employ skilled installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.

E. Restore work with new Products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

H. Refinish proposed openings and/or windows to match adjacent finish. Include all necessary materials and labor as required to leave an acceptable finish surface.

END OF SECTION

SECTION 01120 — ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Products and installation for patching and extending Work.

B. Transition and adjustments.

C. Repair of damaged surfaces, finishes, and cleaning.

1.3 RELATED SECTIONS

A. Section 01100 – Summary: Work sequence and Phasing.

B. Section 01045 – Cutting and Patching: Requirements and limitations for cutting and patching of work.

C. Section 01500 – Temporary Facilities and Controls: Temporary enclosures, protection of installed work, and cleaning during construction.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New Materials: As specified in product sections; match existing Products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing Products where necessary, referring to existing Work as a standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that demolition is complete and areas are ready for installation of new Work.

B. Beginning of restoration Work means acceptance of existing conditions.

3.2 PREPARATION

A. Cut, move, or remove items as necessary for access to alterations and renovation Work. Store items scheduled for reinstallation. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

E. Close openings in exterior surfaces to protect existing work, salvaged, and stored items from weather and extremes of temperature and humidity. Temporarily seal wall cavities and substrates exposed by cutting, patching, and demolition work to prevent accumulation and trapping of moisture which will allow the development of mildew.

3.3 INSTALLATION

A. Coordinate work of alterations and renovations to expedite completion sequentially. Do not remove existing items which weatherproof buildings (windows, roofing, doors, exterior finishes etc.) until new materials and items are ready for installation.

B. Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring products and finishes to specified condition. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes, in accordance with Section 01045 – Cutting and Patching.

C. Install Products as specified in individual sections.

3.4 TRANSITIONS

A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division. Consult Architect for direction on making transitions.

3.5 ADJUSTMENTS

A. Where removal of partitions or walls result in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Fit work at penetrations of surfaces as specified in Section 01045 – Cutting and Patching.

3.6 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

B. Repair substrate prior to patching finish.

3.7 FINISHES

A. Finish surfaces as specified in individual Product sections.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

END OF SECTION

SECTION 01200 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 UNIT PRICES

A. Changes to the Work incorporating Unit Prices will be made by Change Order.

1.3 CONTRACT MODIFICATION PROCEDURES

A. On Owner's approval of a proposal from Contractor, Architect will issue a Change Order on AIA Document G701, for all changes to Contract Sum or Contract Time.

B. When Owner and Contractor disagree on the terms of a proposal, Architect may issue a Construction Change Directive on AIA Document G714, instructing Contractor to proceed with the change. Construction Change Directive will contain a description of the change and designate the method to be followed to determine changes to Contract Sum or Contract Time.

1.4 PAYMENT PROCEDURES

A. Submit a Schedule of Values **at least 10 days before** the first Application for Payment. In Schedule of Values, break down Contract Sum into at least one line item for each Specification Section. Correlate the Schedule of Values with Contractor's Construction Schedule.

B. Submit 3 copies of each application for payment on AIA Document G702/703, according to the schedule established in Owner/Contractor Agreement.

1. For the second Application for Payment through the Application for Payment submitted at Substantial Completion, submit partial releases of liens from each subcontractor or supplier for whom amounts were requisitioned in the previous Application for Payment.
2. Submit final Application for Payment after completion of Project closeout procedures with release of liens and supporting documentation. Include consent of surety to final payment and insurance certificates.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01300 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 PROJECT MANAGEMENT AND COORDINATION

A. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.

B. Coordinate construction to ensure efficient and orderly execution of each part of the Work.

C. Progress meetings will be held at Project site every two weeks. Notify Owner and Architect of meeting dates. Each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend. The Contractor shall:

1. Prepare a progress meeting agenda.

2. Prepare a sign in sheet for each progress meeting.

3. Prepare minutes of each meeting and distribute to parties present.

1.3 CONSTRUCTION SCHEDULE

A. Prepare a horizontal bar-chart construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion.

1. Submit within twenty (20) days after date established for Commencement of the Work.
2. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
3. Indicate Substantial Completion and allow time for Architect's procedures necessary for certifying Substantial Completion.
4. Schedule Distribution: Distribute copies to Owner, Architect, subcontractors, and parties required to comply with dates.

5. Updating: Revise the schedule after each meeting or activity where revisions have been made. Distribute revised copies to Owner, Architect, subcontractors, and parties required to comply with dates.

1.4 SUBMITTAL PROCEDURES

A. Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and activities that require sequential operations.

1. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work.
2. Architect will not accept submittals from sources other than Contractor.

B. Prepare submittals by placing a permanent label on each for identification. Provide a 4 by 5 inch space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:

1. Project name.
2. Date.
3. Name and address of Contractor.
4. Name and address of subcontractor or supplier.
5. Number and title of appropriate Specification Section.
6. Contractor's certification that materials comply with specified requirements.

C. Coordinate each submittal with other submittals and with work that does not require submittals.

D. Product Data: Mark each copy to show applicable choices and options. Include the following:

1. Data indicating compliance with specified standards and requirements.
2. Notation of coordination requirements.
3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.

E. Shop Drawings: Submit newly prepared information drawn to scale. Do not reproduce Contract Documents or copy standard information. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Architect will return the reproducible print. Include the following:

1. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
2. Identification of products and materials.
3. Notation of coordination requirements.
4. Notation of dimensions established by field measurement.
5. Identification of deviations from Contract Documents.

F. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit sufficient units to show limits of the variations. Include product name or name of the manufacturer.

G. Architect will review each submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01340 - SUBMITTALS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide shop drawings, product data, physical samples and color samples as indicated herein and in each technical section of these specifications.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Additional submittal requirements specific to the particular section of the specifications.

PART 2 - PRODUCTS

2.1 SHOP DRAWINGS

A. Prepare shop drawings using competent draftsmen, clearly and precisely showing the following:
   1. The size and gage of members.
   2. The method of anchoring and securing members of parts together.
   3. The quantity and location of each item.
   4. Other pertinent data necessary to show the Work to be done and where and how it is to be done.

B. Prepare Drawings to scale, including full size details as required to fix and illustrate the Work required. Do not use Contract Documents or reproductions thereof as shop drawing submittals.

C. Each sheet of Drawings shall be 30 x 40 inches maximum size with borders. Provide a title block in the lower right hand corner with the following information:
   1. Title of the sheet.
   2. Name and location of Project.
   3. Names of:
      a. Architect/Engineer.
      b. General Contractor.
      c. Manufacturer of the specified materials and equipment.

4. The date of the Submittal.
5. The date of each correction or revision.
6. **Submittal number including Division No.** (such as submittal no. 3 under Division 11 is numbered "11-03").

D. Fold drawings to 8-1/2x11 inch dimensions with title block exposed to top.

E. Check the Drawings and add any corrections of field measurements needed. Stamp and sign the Contractor's approval, checker's signature, and date of approval before submitting to the Architect. Shop Drawings which do not bear the Contractor's stamp or have not been reviewed by the Contractor, will be returned by the Architect without review or approval.

F. Number Shop Drawings consecutively. Indicate working and erection dimensions, arrangements, sectional views, necessary details including complete information for making connections with other Work, kinds of materials, and finishes.

G. Provide a transmittal letter in duplicate, pointing out any deviations from items, methods or named manufacturers included in the Specifications or on the Drawings. Note submittal file number including Division.

H. Submit **six (6)** blue line prints of each Shop Drawing sheet.

I. Make such corrections, changes, resubmit bound sets of Shop Drawings prints, as required herein, until approved is obtained. Any corrections or changes indicated on Shop Drawings shall not be considered as an extra work order.

2.2 PHYSICAL SAMPLES

A. Provide duplicate samples of items as specified. Samples shall be 12 inches square or 12 inches long unless noted otherwise. Minimum liquid samples shall be 1 pint. Installed materials shall match approved samples.

B. For Architect's permanent files provide one (1) 6" x 6" sample of all interior finishes, colors and materials (aluminum finish, glazing, plastic laminate, paint finish flooring materials, ceiling finish, etc.)

C. Provide a transmittal letter with each sample, listing the following:
1. Specification section title and paragraph specifying the material.
2. Name and location of Project.
3. Names of:
   a. Architect/Engineer.
   b. General Contractor.
   c. Manufacturer of the specified materials and equipment.
4. The date of the Submittal.
5. Submittal file number including Division.

D. If samples are not acceptable they will be returned directly to the Contractor for modification and resubmission.

E. If samples are acceptable, notification will be sent directly to the Contractor, and the sample retained for comparison with the complete Work.

2.3 MANUFACTURER'S PRODUCT DATA

A. Provide **six (6)** copies of pre-printed Product Data of items as specified. Carefully mark out all items not applicable to the specified item.

B. Standard catalogs, brochures, etc. including information not applicable to the project and not marked through, will be returned without review or approval.

C. Provide a transmittal letter with the Product Data from each manufacturer, listing the following information:
   1. Name and location of Project.
   2. Names of:
      a. Architect/Engineer.
      b. General Contractor.
      c. Manufacturer of the specified materials and equipment.
   3. The date of the Submittal.
   4. Submittal file number including Division.

D. If Product Data is not approved, one copy will be marked and returned directly to the Contractor for modification and resubmission.

E. If Product Data is approved, notification and one copy of the acceptable Product Data will be sent directly to the Contractor.

F. When requested by the Architect, provide six (6) copies of each ASTM Federal Specification, or other applicable documents referenced in the material Section.

PART 3 - EXECUTION

3.1 REVIEW PROCEDURE

A. Submittals will be reviewed with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Architect shall be allowed a maximum review period of **fourteen (14)** calendar days. The review of a separate item shall not indicate a review of an assembly in which the item functions. Submittals that contain excessive errors or that are incomplete will be returned without review and approval and any delay caused thereby shall be the responsibility of the Contractor.

B. If any submittals are not approved as submitted, all copies will be returned directly to the Contractor for revision. The reviewed submittals will be returned to the Contractor as soon as practicable.

C. The Contractor shall make all revisions as noted and shall resubmit the required number of corrected copies of submittals, until no exceptions are taken. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than those requested on previous submissions.

D. The review of submittals shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents unless the Contractor has submitted, in writing, such deviations and written approval has been given to each specific deviation. The review shall not relieve the Contractor from responsibility for errors and omissions in the Shop Drawings and samples.

E. No portion of the Work requiring a submittal shall commence until the submittal has been approved as designated in the Conditions of the Contract. All such portions of the Work shall be in accordance with the submittal that has been stamped with final "Reviewed Without Exceptions" note, or "Approved" note.

F. Materials and equipment specified or approved prior to beginning the Work are required to be used on the Project. Any proposed substitution resulting from no availability of specified items must be proven "better than" by the Contractor and approved in writing by the Architect. Substitutions included in submittals shall be so noted and brought to the Architect's attention in the submittal and on the transmittal. Failure to follow this procedure will render the substitution as not acceptable whether or not reviewed by the Architect.

G. The Contractor shall have the approved shop drawings at the site at all times for use in the construction of the Work. Failure of the Contractor to supply such drawings will be deemed sufficient cause to delay the Work until such drawings are available for field use and reference.

H. For submittals that will be reviewed by one of the Architect's consultants, these submittals shall be delivered directly to the Architect. The Architect will then be responsible to provide the Consultant with a copy of the submittal.

I. For submittals that will be reviewed by one of the Architect's consultants, do not send to the Consultant as part of the package any items which will be reviewed by the Architect. As an example, do not provide a single submittal package combining Structural Steel and Miscellaneous Metal Fabrications.

END OF SECTION

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Quality-control services include inspections, tests, and related actions including reports. Quality-control services are further specified in other Sections of these Specifications and shall be performed by independent testing agencies provided by Contractor or Owner, as specified.

1. Unless otherwise indicated, quality-control services required by authorities having jurisdiction will be provided by Owner.

B. Contractor is responsible for scheduling inspections and tests.

C. Retesting: Contractor shall pay for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.

D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify agency in advance of operations requiring tests or inspections, to permit assignment of personnel. Auxiliary services include the following:

1. Access to the Work.
2. Incidental labor and facilities to assist inspections and tests.
3. Adequate quantities of materials that require testing, and assisting in taking samples.
4. Facilities for storage and curing of test samples.
5. Security and protection of samples and test equipment.

E. Duties of Testing Agency: Testing agency shall cooperate with Architect and Contractor in performing its duties. Agency shall provide qualified personnel to perform inspections and tests.

1. Agency shall promptly notify Architect and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. Agency shall not perform duties of Contractor.

F. Submittals: Testing agency shall submit a certified written report of each inspection and test to the following:

1. Owner.
2. Architect.
3. Contractor.
4. Structural engineer.
5. Authorities having jurisdiction, when authorities so direct.

G. Report Data: Reports of each inspection, test, or similar service shall include at least the following:

1. Name, address, and telephone number of testing agency.
2. Project title and testing agency's project number.
3. Designation (number) and date of report.
4. Dates and locations where samples were taken or inspections and field tests made.
5. Names of individuals taking the sample or making the inspection or test.
6. Designation of the product and test method.
7. Complete inspection or test data including an interpretation of test results.
8. Ambient conditions at the time of sample taking and testing.
9. Comments or professional opinion on whether inspected or tested Work complies with requirements.
10. Recommendations on retesting or reinspection.
11. Name and signature of laboratory inspector.

H. Testing Agency Qualifications: Engage inspection and testing agencies that are prequalified as complying with the American Council of Independent Laboratories' "Quality Assurance Manual" and that specialize in the types of inspections and tests to be performed.

1. Each testing agency shall be authorized by authorities having jurisdiction to operate in the state where Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01500 — TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone and fax service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage and temporary buildings.

1.3 TEMPORARY ELECTRICITY

A. Cost: By General Contractor. Utilize existing power service if approved by Owner. Extend temporary outlets in NEC and OSHA approved manner to facilitate construction.

B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

C. Provide main service disconnect and over correct protection at convenient location.

D. Provide sufficient and adequate distribution equipment, wiring, and outlets to ensure unimpeded progress of the Work.

E. Permanent convenience receptacles may be utilized during construction.

1.4 TEMPORARY LIGHTING

A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Permanent building lighting may be utilized during construction.

E. Maintain lighting and provide routine repairs.

1.5 TEMPORARY HEAT

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

B. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in product sections.

1.6 TEMPORARY COOLING

A. If required for the proper installation of particular materials, systems, or equipment, provide and pay for cooling devices and cooling as needed to maintain specified conditions.

1.7 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidify, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Utilize existing ventilation equipment if approved by Owner. Extend and supplement equipment with temporary fan units as required to maintain clear air for construction operations.

1.8 TELEPHONE SERVICE

A. Provide, maintain and pay for telephone service to field office.

1.9 FACSIMILE SERVICE

A. Provide, maintain and pay for separate telephone line to be used solely for fax service to field office.

1.10 TEMPORARY WATER SERVICE

A. Utilize existing water service if approved by Owner for construction operations.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing as required.

1.11 TEMPORARY SANITARY

A. Provide and maintain required facilities and enclosures. Existing facility use is **not** permitted. Provide at time of project mobilization.

1.12 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas to protect existing facilities and adjacent properties from damage from construction operations and demolition. Barriers must isolate occupied use from construction activities. If and when needed, barriers must be capable of attenuating sound.

B. Provide protection for existing plant life and landscaped. Maintain plant life and landscaped areas as necessary during construction operations. Replace damaged plant life and landscaping.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

D. Barrier plan and method subject to approval by the Architect and the Owner.

1.13 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site, equip with vehicular and pedestrian gates with locks. Fence must be capable of restricting entry by on-site facility users.

1.14 WATER CONTROL

A. Grade site to drain where additions are undertaken. Maintain excavations free of water. Provide, operate, and maintain pumping equipment and/or any other means, methods or techniques necessary to maintain excavation and site free of water.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.15 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protect for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

B. Provide temporary protection of existing wall cavities, substrates, and surfaces exposed to weather during cutting and minor demolition operations to prevent entrapment of moisture and development of mildew.

1.16 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection to prohibit damage and where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic in all landscaped areas.

1.17 SECURITY

A. Provide security and facilities to protect Work and existing facilities from unauthorized entry, vandalism, or theft.

B. Coordinate project security program with Owner's existing security operations at project mobilization.

C. Maintain program throughout construction period until Owner acceptance precludes the need for Contractor security.

D. Restrict entrance of persons and vehicles into Project site and existing facilities, allowing entrance only to authorized persons and persons identified by the Contract Document and/or the Architect or Owner as authorized to visit Project site.

1.18 ACCESS

A. Provide and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate as work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Existing on-site roads may be used for construction traffic.

1.19 PARKING

A. Provide temporary surface parking areas to accommodate construction personnel. Existing site areas may be used if approved in advance by the Owner.

B. Contractor to propose plan for Owner concurrence and approval.

1.20 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.21 PROJECT IDENTIFICATION

A. Provide project sign. Refer to drawings for size and content.

B. Erect on site at location established by Architect.

C. No other signs are allowed without Owner permission except those required by law.

1.22 FIELD OFFICES AND SHEDS

A. Office: Weather tight with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table, phone and fax.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Provide storage sheds and facilities to accommodate Work. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01600.

D. Designated existing covered and uncovered hard paved areas and facilities may be used for field storage areas. Protect and secure existing areas used for storage. Upon completion of Work, clean, repair, and restore all existing areas used for storage and restore to acceptable condition.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials prior to Substantial Completion.

B. Remove underground installation to a minimum depth of 2 feet. Grade site to drain.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01600 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUBSTITUTION REQUIREMENTS

A. When material, article, or method is specified using name of proprietary product manufacturer, vendor, or method followed by phrase "or equal," specific item mentioned establishes basis upon which projects are to be built.

1. Other manufacturers' materials, articles, and methods not named will be considered as substitutions provided required information is submitted on “SUBSTITUTION REQUEST FORM” and will not require substantial revisions of Contract Documents.

2. This applies to specific construction methods when required by Contract Documents.

3. Substitution Requests must be filled out on enclosed “Substitution Request Form”.

B. Whenever material, article, or method is specified or described without phrase "or equal," no substitutions will be allowed.

C. Costs for redesigns due to substituted items are responsibility of Applicant.

D. In making request for substitution, Applicant/Contractor represents that he:

1. Has personally investigated proposed product or method and determined that it is equal in all respects to that specified.

2. Will provide same guarantee for substitution as for product or method specified.

3. Will coordinate installation of accepted substitution into work, making design and construction changes to complete work in all respects following the Contract Documents.

1.3 SUBMITTAL OF DATA FOR PROPOSED SUBSTITUTIONS

A. In order for substitutions that do not change design intent to be considered, submit no later than 10 days prior to bid date deadline, 3 copies of complete data set forth herein to permit complete analysis of proposed substitutions listed on submitted “SUBSTITUTION REQUEST FORM”.

1. For Products:
   a. Identification including manufacturer's name and address.
   b. Manufacturer's literature, including but not necessarily limited to:
      1) Product description, performance, and test data.
      2) Reference standards.
   c. Samples where appropriate.
   d. Name and address of similar projects on which product was used and dates of installation with contact name and telephone number.

2. For Construction Methods:
   a. Detailed description of proposed method.
   b. Drawings illustrating methods.
   c. Name and address of similar projects on which method was used and dates of use with contact name and telephone number.

3. Comparison of proposed substitution with product or method specified

4. Data relating to impact on construction schedule by proposed substitution.

5. Impact on other contracts.

1.4 APPROVAL OF SUBSTITUTION

A. Architect's decision regarding evaluation of substitutions will be final and binding.

B. All approved substitutions will be incorporated into the Contract Documents by Addendum.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION
NOT USED

SUBSTITUTION REQUEST FORM

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.: _____

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

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

The Undersigned certifies:

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

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01340 Submittals
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01340 Submittals
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

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

END OF SECTION

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Unless otherwise indicated, demolished materials become Contractor's property. Remove from Project site.

B. Items indicated to be removed and salvaged remain Owner's property. Remove, clean, and deliver to Owner's designated storage area.

C. Comply with EPA regulations and disposal regulations of authorities having jurisdiction.

D. Conduct demolition without disrupting Owner's use of the building.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DEMOLITION

A. Maintain and protect existing utilities to remain in service before proceeding with demolition, providing bypass connections to other parts of the building.

B. Locate, identify, shut off, disconnect, and cap off utility services to be demolished.

C. Employ a certified, licensed exterminator to treat building and to control rodents and vermin.

D. Conduct demolition operations and remove debris to prevent injury to people and damage to adjacent buildings and site improvements.

E. Provide and maintain shoring, bracing, or structural support to preserve building stability and prevent movement, settlement, or collapse.

F. Protect building structure or interior from weather and water leakage and damage.

G. Protect remaining walls, ceilings, floors, and exposed finishes. Erect and maintain dustproof partitions. Cover and protect remaining furniture, furnishings, and equipment.

H. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.

I. Promptly patch and repair holes and damaged surfaces of building caused by demolition. Restore exposed finishes of patched areas and extend finish restoration into remaining adjoining construction.

J. Promptly remove demolished materials from Owner's property and legally dispose of them. Do not burn demolished materials.

END OF SECTION

SECTION 01800 — GENERAL NOTES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 GENERAL NOTES

A. **Do not dimension the drawings. Any dimensions, questions, should be directed to the Architect or Engineer.**

B. Contractor shall protect all streets and sidewalks and shall make all necessary repairs at his own expense.

C. Shall at all times protect the excavations, trenches, and/or the building from damage from rain water, ground water, backing up drains or sewers and all other water. He shall provide all pumps and equipment and enclosures to provide this protection.

D. Contractor shall provide all shoring, bracing and sheathing as required for safety and proper execution of the work and remove same when work is completed. Contractor shall be responsible for all scaffolding, shoring, bracing, sheathing, temporary construction and temporary walkways, etc., and shall hold harmless the Owner and Architect from any injury or litigation as a result of causes related to any scaffolding, shoring, bracing, sheathing, temporary construction and temporary walkways.

E. Contractor shall comply with the Trench Safety Law Requirements.

1.3 WAIVER OF LIEN:

A. In submitting a proposal (Bid) Contractor, if awarded the Contract, explicitly warrants that the Owner shall be held free of any claim or lien of any nature resulting from Contractor’s pursuance or prosecution of the work. This shall cover any third party lien in any manner whatsoever concerning Contractor’s performance or payment on this project.

1.4 CONTRACTOR’S ASBESTOS FREE AFFIDAVIT:

A. In order to protect staff, employees and public in general from any unnecessary exposure to asbestos fibers, the Asbestos Hazard Emergency Response Act prohibits the use of asbestos containing materials in all forms in the construction and operation of this facility.

B. Failure to complete this waiver constitutes non-compliance with the job specifications. This document shall be attached to the Contract between Owner and Contractor and to the closeout documents.

1.5 AFFIDAVIT:

A. I, certify that I am familiar with the materials used in the construction of, and incorporated into, the construction described below. I further certify that to the best of my knowledge and belief no asbestos containing materials, either friable or otherwise were used in the process of constructing or incorporated into the construction.

The undersigned, being duly sworn upon his/her oath deposes and says that he/she is the person making the foregoing statements and that they are made in good faith and are true in every respect.

Contractor's signature:

STATE OF

COUNTY OF

I, _____, a Notary Public in and for said County, in the State aforesaid, DO

THEREBY CERTIFY THAT _____, personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person, and acknowledge that he/she signed, sealed, and delivered said instrument as his/her free and voluntary act, for the uses and purposes herein set forth.

GIVEN UNDER MY HAND AND NOTARIAL SEAL THIS DATE OF , 20

NOTARY PUBLIC:

MY COMMISSION EXPIRES:

(NOTARY SEAL)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 02100 — SITE CLEARING, GRADING AND FILLING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Clearing, filling and grading of the affected areas of the site.

B. Top Soil removal and reuse.

C. Disposal of debris and surplus materials.

D. Protection of trees and vegetation to remain, coordinate with the Architect.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS:

A. Excation and backfilling for underground site utilities.

B. Paving and sidewalks.

C. Site drainage systems.

1.4 QUALITY ASSURANCE

A. Testing Laboratory Services: Installed materials shall meet specified requirements as determined by the Owner’s Testing Laboratory.

B. Proposed sitework contractor shall be able to provide documentation that he has a minimum of three years of satisfactory experience in the performance of similar operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Existing top soil to be stockpiled and reused.

B. Existing and off-site earth fill as required.

C. TOPSOIL:

1. Rich sandy loam, low in silt, free of trash, rocks, debris and other foreign materials.
2. Topsoil stripped at the site and stockpiled may be used if material meets the above requirements and quantities are sufficient to meet all topsoil needs of the site. Otherwise topsoil meeting specified requirements and approved by the testing laboratory shall be provided from an approved off site source.

D. FERTILEZER AND GRASSING: Provide grass to replace any disturbed areas during regarding.

PART 3 - EXECUTION

3.1 PROTECTION OF EXISTING TREES AND VEGETATION

A. GENERAL: In addition to any temporary construction fencing provided under Section 01500 Temporary Facilities, provide temporary chain link fencing around existing shrubs, grasses, ground cover and tress indicated to remain. Locate fencing around drip lines of individual trees or groups of trees.

B. REPLACEMENT: Replace damaged existing trees and vegetation indicated to remain with materials of like kind, size and maturity as approved by the architect. Follow supplier’s recommended procedures of planting.

3.2 TOPSOIL REMOVAL AND EXCAVATION

A. Strip topsoil to a depth of 4” to 6” under all new site paving, sidewalks, within new building lines and at all site areas which will receive earth fill for grading adjustments.

B. Temporarily store removed topsoil at an on-site location designated by the Architect. Stored topsoil shall be kept free of trash and construction debris.

C. Remove additional existing soil as required to achieve any finish paving grades which may be at or near natural grade elevation.

3.3 EXCAVATING, GRADING AND FILLING

A. GRADE ELEVATIONS: Establish finish grades as indicated on the drawings. Set and maintain grade stakes.

B. ROUGH GRADING:

1. Provide clean earth fill meeting specified requirements from off-site should additional earth fill be required.
2. Provide temporary and permanent drainage swales, pumps, gutters and trenches necessary to dry existing soil and carry off water during construction. As indicated on drawings shape the site around structures to drain away from the building(s) at all times. Do not allow water to stand around trees scheduled to remain.

3. All site fill at unpaved and typical sidewalks areas shall be thoroughly compacted in lifts as specified below. Each layer and subgrade shall be wetted or dried as required to achieve optimum moisture content and then compacted to minimum ninety (90%) percent Proctor density per ASTM D1557. The subgrade shall be thoroughly and completely scarified before wetting and rolling.

C. COMPACTION: Compaction may be obtained by any of the following methods:

1. By sheepsfoot rollers having a unit weight on the contact feet of not less than 300 pounds per square inch with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
2. By pneumatic tired rollers having a minimum compression of 325 pounds per inch of width of tire tread, with the soil being compacted in layers not exceeding 8" in depth (loose measurement).
3. For those portions of fill which cannot be reached with the sheepsfoot roller, such as corners and areas adjacent to columns, beams, etc., mechanical tampers shall be employed to obtain specified compaction.

D. EXISTING UTILITIES:

1. Arrange with utility companies for removal or relocation of any existing utilities.
2. Remove abandoned utilities up to the property line and provide permanent watertight cap.
3. If unknown or uncharted utilities are encountered during excavation, promptly notify the Architect before proceeding. Damage to existing utilities by continuing work without notifying the Architect shall be repaired by the Contractor at no additional cost to the Owner.

E. FINISH GRADING;

1. After rough grading and proof rolling operations are complete, install 2" of topsoil over unpaved open area (within the limits of grading) and fine grade to finish contours and make ready to receive grass planting (whether or not grass planting is required under this contract).
2. Open areas shall be raked smooth and left free of clumps, trash, debris and vegetation. Finish grading shall be uniform in planarity, meeting elevations and slopes as indicated on the drawings, and as required to ensure proper drainage.

3.4 DISPOSAL:

1. Adhere to Federal, State, County and local regulations regarding disposal of removed trees, shrubs, vegetation, soil, and rubble. It is the sole responsibility of the Contractor to determine the regulations regarding on-site burning of removed trees and vegetation.
2. Upon completion of fine grading operations, any excess soil shall be removed from the site, stockpiled at the site, or relocated to any property controlled by the Owner within five miles of the site. The above options shall be as determined by the Owner at no additional cost to the Owner.

END OF SECTION

SECTION 02361 - TERMITE CONTROL

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Submittals: Product Data and product certificates signed by manufacturer certifying that products used comply with U.S. EPA regulations for termiticides. Include application instructions and EPA-Registered Label.

B. Engage a licensed professional pest control operator to apply termite control solution.

PART 2 - PRODUCTS

2.1 TERMITICIDES

A. Provide an EPA-registered termiticide (5 year) complying with requirements of authorities having jurisdiction, in a soluable or emulsible, concentrated formulation that dilutes with water or foaming agent. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare surfaces and apply treatment at rates and concentrations recommended in manufacturer's written instructions.

B. Apply termite control to the following:

1. At foundations. (Piers, mid-span supports)
2. Under sub-floors and flooring materials.

3. Under basement floor slabs.
4. At hollow masonry.
5. At expansion and control joints and slab penetrations.
6. At crawlspaces; treat soil under and adjacent to foundation supports. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment.

C. Post warning signs in areas of application.

D. Reapply soil termiticide treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION

SECTION 02520 — CONCRETE PAVING, CURBS AND SIDEWALK

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. All site concrete work, including sidewalks, paving, equipment slabs, ramps, curbs and other miscellaneous concrete.

B. All form work.

C. Reinforcing steel.

D. Installation of sleeves provided by plumbing, heating, and electrical contractors for work under site concrete. Sleeves for irrigation system.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Testing Laboratory services.

B. Excavation and fill.

C. Soil stabilization.

1.4 DRAWING REFERENCES: See drawings for reinforcing sizes and placement.

1.5 SUBMITTALS

A. DESIGN MIX: Submit six (6) copies directly to the Owners Testing Laboratory the proposed concrete mix for concrete paving and sidewalks. Include cement brand and type, aggregate identification, admixtures, proportions and anticipated strengths.

B. PLASTIC CHAIR SUPPORT: Submit manufacturer's literature indicating dimensions, configuration, and performance data. Submit sample for approval by the Architect.

C. JOINT FORMS: Submit manufacturer's literature indicating dimensions, configuration, reinforcing and accessories related to load transfer units.

D. ADMIXTURES: Submit manufacturer's literature indicating composition and mix proportions.

E. CURING COMPOUND: Submit manufacturer’s literature indicating composition and recommended application procedures.

F. JOINT SEALANT: Submit manufacturer’s literature indicating sealant type(s), performance, recommended application procedures, and recommending open or closed cell backer material for the application.

G. DELIVERY TICKETS: Furnish copies of delivery tickets for each load of concrete delivered to the site. Provide items of information as follows:

1. Ambient temperature.
2. Any modifications and dispositions of the load.
3. Driver’s identification.
4. Identification of placement location at jobsite.
5. Ingredients by weight.
6. Number of cubic yards.
7. Time emptied.
8. Time loaded.

H. TEST REPORTS: Arrange for the Owner’s Testing Laboratory to submit reports to the Owner, Architect and Contractor indicating compressive strength, aggregate type and slump for samples taken at the site.

1.6 SAMPLES

A. Plastic chair support.

B. Minimum 36" x 36" finish samples at the job site for Architects approval. Provide sample for each type of finish (smooth, light broom, medium broom, etc.) and each type of joint.

1.7 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.8 QUALITY ASSURANCE

A. Cast-in-place concrete shall be installed by technicians specially trained in the proper handling, placing and protection of concrete and reinforcing steel. If required by the Architect, installer shall submit for approval a list of similar installations successfully completed.

B. Cast-in-place concrete shall be mixed and installed in strict accordance with applicable written recommendations and requirements of the Texas State Department of Highways and Public Transportation (TSDHPT) and the American Concrete Association (ACI) including but not necessarily

limited to the following where documents conflict, the most stringent of the requirements as determined by the Architect shall apply:

1. TSDHPT, item 360.
2. ACI 302.
3. Building Code Requirements for Reinforced Concrete, ACI 318.
4. Recommended Practice for Hot Weather Concreting, ACI 305.
5. Recommended Practice for Cold Weather Concreting, ACI 306

PART 2 - PRODUCTS

2.1 MATERIALS

A. GENERAL: All materials used in the Work shall be stored or handled in a manner which will prevent deteriorations; any materials that have been damaged shall be immediately and completely removed from the Work. All manufactured materials, such as cement, shall be delivered and stored in their original packages, plainly marked with the brand and manufacturer's name. Broken packages or packages that show marks or other evidence of damage shall be wholly rejected.

B. CEMENT: Portland cement shall conform to standard specifications of ASTM,C-150, Type l, latest edition. The brand shall be one approved by the Architect, and this one brand shall be used throughout the project.

C. AGGREGATES: Aggregates for concrete of normal weight shall be clean, hard, strong, uncoated, free of loam, fine sand, clay dust, organic or other deleterious matter and shall conform to ASTM C-33.

FINE AGGREGATE		COARSE AGGREGATE			
Sieve Size	Percent Passing	Sieve Size	1-1/2	Percent	3/4
4	95-100	1-1/2	95-100	-	-
16	50- 88	1”	-	90-100	-
50	10-30	3/4"	40-70	-	90-100
100	0- 5	1/2"	-	25- 60	
		3/8"	10-30	-	20-55
		#4	0- 5	0- 10	0- 10

D. Clay - 3% Maximum Clay - 1 % Maximum

E. WATER: Water shall be clean and potable, free from injurious amounts of oil, acid, Alkali, organic matter or other deleterious substances.

F. REINFORCING STEEL: All reinforcing steel shall be high bond, new billet stock, and shall conform with ASTM A-615, except that mesh shall conform with ASTM A-1 85. All materials must be free from seams, flaws, scale or an excessive amount of rust. The supplier shall furnish Architect with a certificate certifying the reinforcing steel is domestic, or supply laboratory tests acceptable to the Architect, that foreign steel meets these tests. Laboratory tests shall be made on each size of steel. Samples for testing shall be taken from jobsite. The samples shall be replaced with bar of like size and length, plus 40 diameter.

G. ANCHORS: Install all necessary anchors, wire loops or other miscellaneous fasteners to be installed in concrete for anchoring masonry or other work.

H. WOOD JOINT FORMS:

1. Sidewalk Joints: Expansion joints at concrete walks shall be 1X Redwood.
2. Paving Joints: 3/4" thick redwood form with minimum 1" deep removable top strip, 3/4" x 1 0" steel reinforcing bars at 24" o.c. with bond-breaker sleeve on one side, and 3/16" thick steel rebar support plates each side. Provide custom size as required for full depth of paving as manufactured by Shepler Equipment Co., or equivalent by Commercial Lumber Supply, Marine Lumber Co., or Southern States Lumber.

I. TRANSIT MIX CONCRETE: Contractor shall provide concrete meeting the specifications with regard to compressive strength, method of handling, and controlled by testing lab at batch plant. Concrete shall meet ASTM C-94; Certificate from supplier shall be furnished to Architect.

J. CURING COMPOUND: Shall be Southform 4-way (cures, seals, dustproofs, and hardens), or equivalent product by Gifford-Hill, Nox-Chem, Sonneborn, or W.R. Grace.

K. ADMIXTURES:

1. General: All admixtures shall be added at the plant during mixing and must be prior approved by the Testing Laboratory. Admixtures shall comply with requirements of ASTM C-260 and C-494. Admixtures containing calcium chloride are not acceptable. **Do not use admixtures in footings or seal slabs.**
2. Water Reducing Agents: All design mixes must test with the required slumps prior to the addition of a water reducing agent. Each specified maximum slump may be increased by a maximum of 2" at the plant by the addition of a maximum of 3 ounces of water reducing agent per 94 pound bag of cement. Meet requirements of ASTM C494, Type F.

    a. "PSI Super" as manufactured by Cormix Construction Chemicals.
    b. "WRDA-1 9" as manufactured by W.R. Grace.
    c. "Sikament" as manufactured by Sika Chemical Corp.

3. Set-Controlling Agents: Under 40 degrees F., add accelerating agent Over 80 degrees F., add retarding agent.

    a. Cormix Construction Chemicals.
    b. Master Builders
    c. Protex Industries
    d. Sika Chemical Corp.

4. Air Entrainment: All structural concrete shall contain an air entraining agent compatible with other approved admixtures. Agent added at the plant shall produce 4-5% air entrainment - not required at drilled footings.

L. REINFORCING BAR SUPPORTS: Heavy-duty type four-legged plastic chair supports with sand plate. Series "G" or "B" (as determined by job conditions) as manufactured by W.H.C. Products, Inc. or approved equivalent by Aztec Concrete Accessories. Provide sand plate for slab on grade. Space at a maximum of 45" centers each way. Provide closer spacing where required to prevent excessive sag, or to support the weight of concrete pump hose.

M. METAL REINFORCEMENT:

1. Bars

    a. General: Detailing conform to ACI detailing manual.
    b. Grade 60: Comply with ASTM A 615.
    c. Grade 40 (#3 bars): Comply with ASTM A 615.

2. Mesh

    a. Comply with ASTM A 185.
    b. Mesh shall be type which is fabricated and delivered in flat sheets.
    c. Use mesh only where specifically indicated in the drawings for sidewalks or equipment pads.

N. PAVING JOINT SEALANT: Polyurethane base, multi-component, chemical curing, self-leveling Type 1, conforming to requirements of FS TT-S-00227E, Class A (provide equivalent non-sagging Type 2 at vertical joints in curbs), as manufactured by Tremco or equivalent by Sonneborn, Sheplers, or Pecora. Use with flat strip, non-absorbent polyethylene joint backer-open or closed cell type as recommended by the sealant manufacturer.

2.2 MIX DESIGNS

A. The concrete mix shall be designed by the concrete supplier and approved by the Owner's Testing Laboratory. Contractor shall furnish to the laboratory samples of the aggregate he proposes to use in the concrete work. Concrete mixes shall achieve twenty eight (28) day compressive strengths indicated below, and shall be so proportioned as to obtain a workable mix in accordance with the following limits:

Compressive Strength	Minimum Cement	Maximum Total
at 28 days	Content 94#	Sacks Water Per Sack of Cement
Minimum P.S.I.	Cubic Yard	Gallons
Paving 3,500	5.5	7.0

B. SLUMPS: Slumps greater than specified can adversely affect concrete performance due to excessive shrinkage. Slumps specified below are based upon concrete design mix prior to addition of any approved water reducing agent.

1. 5"+/-1": Sidewalks
2. 3"+/-1": Paving,curbs

C. The use of fly ash in the concrete mix is not acceptable.

D. MIXING

1. Comply with ASTM C 94.
2. Mix concrete to a uniform distribution of materials. Mix at least two minutes after materials are in mixer. Discharge concrete completely before mixer is recharged.
3. Mix each batch not less than 70 or more than 100 revolutions of the drum at mixing speed. Additional mixing is to be done at agitating speed.

E. ADJUSTMENTS TO MIX DESIGN: Submit for approval by the Owner's Testing Laboratory any proposed adjustments to the approved mix design due to job conditions, weather or testing results. Necessary adjustments to the mix design shall be at the Contractor's expense.

PART 3 - EXECUTION

3.1 PREPARATION

A. Any portions of the subgrade or fill that are below optimum moisture content shall be wetted at least one (1) week prior to placing concrete in order to achieve a proper uniform distribution of moisture.

B. All preliminary work shall be carefully checked, all trash and debris removed, and the approval of the Architect obtained before any concrete is placed. The Architect shall be notified twenty-four (24) hours before any concrete is scheduled to be placed.

C. SUBGRADE APPROVAL- The bearing grade of slab-on-grade concrete shall require approval of the Owner's testing laboratory immediately prior to the placement of concrete regardless of any previous test results. Bearing grade which is overly dry, saturated, exhibits standing water, contaminants, irregularities or other properties which may tend to be deleterious to the performance of the cast-in-place concrete will not be approved by the Owner's testing laboratory as suitable for concrete placement.

D. Coordinate and provide for plumbing, electrical, carpentry, masonry, miscellaneous metals and other installation requirements, which must be completed prior to concrete work or which may require special forming or block-outs.

E. CLEANING: Clean all forms of debris and thoroughly wet wood forms before placing concrete.

F. Inspect subgrade to determine that uniform thickness of concrete paving and walks will result in proper drainage and no standing water. Notify Architect prior to beginning work of any no slope areas or potential standing water conditions.

G. HOT WEATHER CONDITIONS: Where ambient temperature exceeds 95 degrees F. with a wind velocity exceeding 5 MPH or temperature exceeds 90 degrees F. with a wind velocity exceeding 15 MPH, follow recommendations in ACI publication "SLABS ON GRADE" to protect against rapid drying.

H. Do not place concrete when air temperature is 40 degrees F. or below or when the air temperature is expected to go below 30 degrees F. in the following 48 hours after placing of concrete unless the concrete is protected from such temperature.

I. Install all anchors, fasteners, junction boxes, curb dowels collection boxes or other construction to be installed within concrete paving.

3.2 INSTALLATION

A. TRANSIT: Concrete shall be agitated continuously with slow revolutions of the drum white in transit. No concrete shall be deposited after being in the mixer more than 90 minutes. Testing laboratory shall check each delivery ticket and notify Contractor immediately of any concrete arriving more than 90 minutes after plant loading.

B. HANDLING: Concrete shall be deposited in the forms as rapidly as practicable by methods which will prevent loss or separation. It shall be deposited as nearly as practicable in its final position to avoid rehandling. Provide runways, or other means for wheeled equipment to carry concrete to points of deposit.

C. PLACING REINFORCEMENT:

1. A thin film of rust will not be considered objectional, but no loose or scaly rust, dirt, mud or cement will be allowed. Steel must be cleaned with wire brushes or replaced if pitted from rust.
2. Accurately position, secure against displacement with #18 gauge wire ties or suitable clips, support by heavy duty plastic chairs with sand plates. Do not use "brick batts" or rubble for support.
3. Follow recommendations of Concrete Reinforcing Steel Institute as to type of steel, splicing, location and placement.

D. PLACING CONCRETE:

1. Deposit and consolidate concrete in a continuous operation, within the limits of joint forms, until the placing of a panel or section is completed.
2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement, other embedded items, and into corners.
3. Maintain reinforcing steel in the proper position continuously during concrete placement operations.
4. Bring slab surfaces to the correct plane with a straight edge or vibrating screed and strike off. Use bull floats or derbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle

water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

5. Concrete surface shall be true to plane within 1/4" against a 10' straight edge.

3.3 JOINTS

A. LOAD TRANSFER UNITS:

1. Install wood joint form in accordance with manufacturer's printed directions prior to concrete pour. All plastic sleeves at reinforcing bars shall be placed running in same direction.
2. Install manufacturers stakes at 48" o.c. maximum where concrete is to be placed on both sides of form simultaneously. Install at 36" o.c. maximum at cold joints.
3. Longitudinal joint forms shall be continuous through transverse joint forms.
4. Pre-wet form boards prior to placement to ensure against dry wood forms removing water at edges of concrete.
5. Leave removable top strip in place and protect until sealant operations begin.

B. WOOD FORMS:

1. Install similar to load transfer units. Use at radiused areas and sidewalks.
2. Kerf where required for radius.
3. Leave removable top strip in place at paving and protect until sealant operations begin. Top strip and sealant not required at sidewalks.

C. KEYED JOINTS:

1. Align metal joint forms and install manufacturer's splice clip at ends to keep joints in alignment during concrete placement.
2. Set all stakes securely to keep joint form from moving during concrete placement.
3. Do not remove forms until concrete has obtained sufficient strength. When removing forms, apply no vertical uplift which may damage or weaken concrete key.

3.4 CURBS

A. Provide machine laid (extruded) reinforced concrete curbs unless monolithic or formed curbs are indicated in the drawings.

B. Apply epoxy to cured concrete paving and continuously lay curb over installed dowels.

3.5 FINISHING

A. GENERAL: Concrete finishes shall match approved jobsite samples approved by theArchitect. Spreading of dry cement for finishing is not acceptable. Begin finishing operations as soon as water sheen has disappeared from surface.

B. PAVING FINISHES: Slabs shall be true to plane within 1/4" in a length of 1 O' machine finish and provide light to medium broom finish (across the direction of traffic) at all paving as approved by the Architect.

C. SIDEWALKS: Provide light broom finish perpendicular to walk. Provide Architect with sample panel of proposed finish for approval prior to beginning work.

D. STEPS AND RAMPS: Shall be constructed as detailed. Exterior steps, landings, and ramps shall be medium broom finished.

E. PAVING JOINTS: Provide tooled eased edges along both sides of redwood joint form to ensure neat appearance, sealant adhesion, and to facilitate removal of top strip. Use 1/8" radius jointing tool.

F. OPEN TOOLED JOINT: Provide scored lines on concrete sidewalks 5'-O" o.c. unless spaced otherwise on the drawings. Joint size shall be 1/4" wide x 1/4 depth of concrete.

G. All concrete paving and walks shall be uniform in color and consistent in finish. Remove and replace any areas dimpled by rain or discolored (concrete mix).

3.6 CURING

A. Apply complete covering of curing compound as soon as concrete is finished and in accordance with manufacturer’s instructions. Curing compound shall be applied as it comes from the can, at the rate of 200 to 300 square feet per gallon.

B. To avoid sealant adhesion problems ensure that curing compound does not seep into paving joints that receive sealant.

3.7 CAP SEALANT

A. Remove redwood top strip from joint forms. Take care to avoid damaging concrete edges. Clean sealant cavity and inspect for proper depth as recommended by sealant manufacturer.

B. Ensure that sealant cavity is clean, dry, and free of dust, dirt, and small stones. Ensure that edges are not contaminated with curing compound, oil or other agents, which might cause adhesion failure. Prime side walls in accordance with sealant manufacturer's recommendations.

C. Install flat ethafoam strip in bottom of sealant cavity to provide bond-breaker at bottom of sealant and to ensure against sealant loss past the joint form. Install strip in thickness required to provide sealant cavity size as recommended by sealant manufacturer. Use no sand or other loose material in joint cavity.

D. Mix sealant thoroughly in accordance with manufacturer’s recommendations and pour to within 1/8" of top of paving. Where sealant must be repoured due to run off or improper level, remove completely all traces of sealant on side walls before next application.

E. At concrete curbs rake joint filler to minimum 1" depth and install sealant manufacturer’s vertical joint grade sealant.

3.8 CLEANING AND PROTECTION

A. Paving is to be kept free of any foreign substances (wax, oil, paint, etc.) or surface irregularities, which may affect the final appearance of the completed installation.

B. Unless otherwise approved by the Architect, no vehicular traffic will be allowed on any concrete slab, paving or drive until after the 7 day concrete tests have been made by the laboratory indicating that the concrete has attained 3,000 psi compressive strength.

C. Contractor shall coordinate with Architect and Owner to determine a suitable on-site “wash-out” area for concrete trucks. Contractor shall be responsible for clean up of the designated area.

D. Contractor shall keep clean all adjacent public streets and rights of way. Wash down daily or more often as needed to maintain a safe condition at entrances/exits to site.

3.9 TESTING LABORATORY CONTROL

A. Contractor shall contact Owner's Testing Laboratory at least 24 hours prior to time of anticipated concrete placement.

B. Contractor shall require the manufacturers of the cement and metal reinforcement to be used in the work to furnish mill certificates showing that such materials meet ASTM standards as specified.

C. Contractor shall follow all requirements of ASTM C 31 concerning the proper handling and protection of concrete test cylinders. Contractor shall provide locked storage facilities for test cylinders with all heat, insulation and protection as required by ASTM C 31.

END OF SECTION

SECTION 02580 — TRAFFIC STRIPING AND PARKING SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide traffic line, parking stripe and symbol painting on concrete/asphalt paving as indicated in the drawings.

B. Provide and install pipe-mounted parking signs at handicapped parking spaces meeting requirements of ADA.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Reinforced concrete paving.

1.4 SUBMITTALS

A. PAINT: Submit manufacturer’s product literature indicating Federal specification numbers and manufacturer’s recommended use and application techniques.

B. Reference Section 01340 SUBMITTALS for additional submittal requirements.

C. Provide full size template for handicapped stall symbol.

1.5 WARRANTY

A. Provide written warranty against defects in material and workmanship for a period of one year after date of Substantial Completion.

B. Warranted defects for paint striping shall include but not necessarily be limited to fading, bleed-thru, spalling, excessive wear or delamination.

PART 2 - PRODUCTS

2.1 MATERIALS

A. PAINT: "Traffic-Line" alkyd base marking paint meeting Federal Specifications TTP-85 and TTP-115 Type 1 as manufactured by Devoe or equivalent.

1. Width: Typically 4 inches unless indicated otherwise in the drawings.
2. Colors:

a. White: Traffic lines, directional symbols, symbols for the handicapped.
b. Yellow: Striping for parking stalls.

B. HANDICAPPED PARKING SIGNS:

1. Provide sign size, colors and copy meeting state, local and federal requirements for handicapped parking signage.
2. Sign blank shall be 1/8" aluminum sheet with Dupont "Emron" glass paint background, graphics and copy.
3. Graphics and copy shall be photo silk screened.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that paving operations are complete and surfaces thoroughly dry, clean, and free of oil or grease stains or other contaminants.

B. Clean with high pressure wash or brush if necessary for proper adhesion.

3.2 PAINT

A. Spray apply two coats of marking paint in patterns indicated on the drawings after weathering of asphalt or concrete paving for a minimum of 30 days. Edges shall be sharply defined.

B. Provide minimum dry thickness of 2.5 mils. Provide additional coats if required for complete hiding.

3.3 HANDICAPPED PARKING SIGNS: Set 2" galvanized pipe sign support in minimum 6" diameter x 24" deep concrete footing.

END OF SECTION

SECTION 02601 — FLEXIBLE BASE

PART 1 - GENERAL

1.00 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.01 GENERAL DESCRIPTION OF WORK:

1. This work shall consist of furnishing and placing a foundation course for surface courses or for other base courses.
2. Flexible base shall be composed of either caliche (argillaceous limestone, calcareous or calcareous clay particles, with or without stone, conglomerate, gravel, sand or other granular materials), crushed stone, gravel, iron, or topsoil, shell, or crushed slag.
3. Flexible base shall be constructed as specified herein in one or more courses in conformance with details, lines and grades shown on the plans, and as established by the ENGINEER.

PART 2 - PRODUCTS

2.01 MATERIALS

1. Materials for flexible base shall be crushed or uncrushed as necessary to comply with the requirements hereinafter specified.
2. Materials shall consist of durable course aggregate particles mixed with approved binding materials.

2.02 LIME STABILIZATION:

1. The material for flexible base shall be lime stabilized.

2.03 TYPES:

1. Type A - Crushed or broken aggregate (excluding gravel aggregate).
2. Type B - Gravel Aggregate
3. Type C - Iron Ore Topsoil
4. Type D - Shell Aggregate with Sand Admixture
5. Type E - Shell Aggregate with Sand and Caliche Ad mixture
6. Type F – Caliche
7. Type G - Crushed Slag
8. Unless otherwise noted on the plans, the CONTRACTOR may use any on type of these types provided the material used meet the requirements set forth in the specification test limits herein.

2.04 GRADES:

1. Unless otherwise shown on the plans or directed by the ENGINEER, the final course of base material shall consist of Grades 1, 2, 3, or 4 as specified in Table 02601-1.
2. Base courses or subbase materials, unless otherwise noted on the plans or directed by the ENGINEER, may consist of Grades 1, 2, 3, or 4 as specified in Table 02601-1.
3. All grades shall, when tested in accordance with standard laboratory test procedures, meet the physical requirements set forth in Table 0260 1 - 1.
4. Testing of flexible base materials shall be in accordance with the following test procedures:

TEST	TESTING PROCEDURE
Preparation for soil constants and sieve analysis	TEX-101-E
Liquid Limit	TEX-104-E
Plastic Limit	TEX-105-E
Plasticity Limit	TEX-106-E
Sieve Analysis	TEX-110-E
Wet Ball Mill	TEX-116-E
Triaxial Test	TEX-117-E (Part I or II)

5. Unless otherwise specified on the plans, samples for testing the material for Soil constants, Graduation and Wet Ball Mill shall be taken prior to the compaction operations.
6. Unless otherwise specified on the plans, samples for triaxial tests shall be taken from the stockpile or from production, as directed by the ENGINEER, where stockpiling is required and from production where stockpiling is not required.

PHYSICAL REQUIREMENTS FOR FLEXIBLE BASE MATERIALS

GRADES				
TYPES	Grade 1:	Grade 2:	Grade 3:	Grade 4:
	(Triaxial class 1 Min. compressive Strength, psi: 45 at 0 psi lateral pressure and 175 at 15 psi lateral pressure	(Triaxial class 1 to 2.3)Min. compress-ive strength, psi: 35 at 0 psi lateral press-ure and 175 at 15 lateral pressure	(Unspecified Triaxial Class)	
TYPE A Crushed or Broken Aggregate (excluding gravel aggregate)	Retained on % Sq. Sieve 1-3/4……...0 7/8”……..10-35 3/8”……..30-50 No. 4……...45-65 No. 40…….70-85 Max LL……35 Max PI……..10 Wet Ball Mill	Retained on % Sq. Sieve 1-3/4”……....0-10 No. 4……..…45-75 No. 40……....60-85 Max LL……40 Max PI……..12 Wet Ball Mill Max. Amt…….50 Max increase in	Retained on % Sq. Sieve 1-3/4”……....0-10 No. 40……....60-85 Max LL……45 Max PI……..15 Wet Ball Mill Max. Amt…….55 Max increase in passing	As Shown On Plans

	Max Amt……40 in Passing No. 40……...20	passing No. 40…….20	No. 40…….20	
TYPE B Gravel Aggregate		Retained on % Sq. Sieve 12-2/4”……..…0-10 No. 4……...30-75 No. 40……..…70-85 Max LL……....35 Max PI……..12	Retained on % Sq. Sieve 1-3/4”…..…...…0-5 No. 4……...30-75 No. 40……..…65-85 Max LL……....35 Max PI……..12	As Shown On Plans
TYPE C Iron Ore Topsoil		Retained on % Sq. Sieve 2-1/2”……..…...…0 No. 40……..…50-85 Max LL……....35 Max PI……..12	Retained on % Sq. Sieve 2-3/4”……..…...…0 No. 40……..…45-85 Max LL……....35 Max PI……..12	As Shown On Plans
TYPE D Sand-Shell		Retained on % Sq. Sieve 1-3/4”……0-10 No. 4……...45-65 No. 40……..…50-70 Max LL……....35 Max PI……..12	Retained on % Sq. Sieve 1-3/4”……..…0 No. 40……..…45-65 Max LL……....35 Max PI……..12	As Shown On Plans
TYPE E Shell with Sand and Caliche		Retained on % Sq. Sieve 1-3/4”……..…0 No. 40……..…45-65 Max LL……....35 Max PI……..10	Retained on % Sq. Sieve 1-3/4”……..…0 No. 40……..…45-65 Max LL……....35 Max PI……..12	As Shown On Plans
TYPE F Caliche		Retained on % Sq. Sieve 1-3/4”……..…0 No. 4……...45-75 No. 40……..…50-85 Max LL……....40 Max PI……..12	Retained on % Sq. Sieve 1-3/4”……..…0 No. 40……..…50-85 Max LL……....40 Max PI……..12	As Shown On Plans
TYPE G Crushed Blast Furn-ance Slag				As Shown On Plans

7. The limits establishing reasonable close conformity with the specified gradation and plasticity index are defined by the following:

1) The ENGINEER may accept the material, providing not more than 2 of 10 consecutive gradation tests performed are outside the specified limits on any individual or combination of sieves by no more than 5% and where no two consecutive tests are outside the specified limits.
2) The ENGINEER may accept the material providing not more than 2 of 10 consecutive plasticity index samples tested are outside the specified limit by no more than two points and where no two consecutive tests are outside the specified limit.

2.05 STOCKPILING:

1. When specified on the plans, the material shall be stockpiled prior to delivery on the road. The stockpile shall be not less than the height indicated and shall be made up of layers of material not to exceed the depth shown on the plans.
2. After a sufficient stockpile has been constructed as specified on the plans, the CONTRACTOR may proceed with loading from the stock - pile for delivery to the road.
3. In loading form the stockpile for delivery to the road, the material shall be loaded by making successive vertical cuts through the entire depth of the stockpile.
4. If the CONTRACTOR elects to produce the Type a material from more than one material or more than one source, each material shall be crushed separately and placed in separate stockpiles so that at least 75 percent of the material in the course aggregate stockpiles will be retained on the No. 4 sieve and at least 70 percent of the material in the fine aggregate stockpile will pass the No. 4 sieve.
5. The materials shall be combined in a central mixing plant in the proportions determined by the ENGINEER to produce a uniform mixture which meets all of the requirements of the specification. In the event that combinations of the materials produced fail to meet all of the specification requirements, the CONTRACTOR will be required to secure other materials which will meet specifications requirements.
6. The cental mixing plant shall be either the batch or continuous flow type, and shall be equipped with feeding and metering devices which will add the materials into the mixer in the specified quantities.
7. Mixing shall continue until a uniform mixture is obtained.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

1. Type roadbed shall be excavated and shaped in conformity with the typical sections shown on the plans and to the lines and grades as established by the ENGINEER.
2. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material.
3. All holes, ruts and depressions shall be filled with approved material and, if required, the subgrade shall be thoroughly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the base material.
4. The surface of the subgrade shall be finished to line and grade as established and in conformity with the typical section shown on the plans, and any deviation in excess of 2 inch in cross section and in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.
5. Sufficient subgrade shall be prepared in advance to insure satisfactory prosecution of the work.
6. Material excavated in the preparation of the subgrade shall be utilized in the construction of adjacent shoulders and slopes or other-wise disposed on as directed, and any additional material required for the completion of the shoulders and slopes shall be secured from sources indicated on plans or as directed by the ENGINEER.

3.02 PLACEMENT OF FIRST COURSE-TYPE A, TYPE B, TYPE C, TYPE F, AND TYPE G MATERIAL:

1. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section.

2. The material shall be delivered in approved vehicles of a uniform capacity, and it shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered in each 100-foot station.

3. Material deposited upon the subgrade shall be spread and shaped the same day.

4. In the event inclement weather or other unforeseen circumstances render impractical the spreading of the material during the first 24-hour period, the material shall be scarified and spread as directed ENGINEER.

5. The material shall be sprinkled, if directed, and shall than be bladed, dragged and shaped to conform to typical sections as shown on plans.

6. All areas and Anests@ of segregated coarse or fine material shall be corrected to removed and replaced with well graded material, as directed by the ENGINEER.

7. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and supplies in the amount directed by the ENGINEER. Such binder material shall be carefully and evenly incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods.

8. The course shall be compacted by method of compaction hereinafter specified as the AOrdinary Compaction@ method or the ADensity Control@ method of compaction as indicated on the plans, or as directed by the ENGINEER.

    1. When the AOrdinary Compaction@ method is to be used, the following provisions shall apply:
        1) The course shall be sprinkled as required and rolled as directed until a uniform compaction is secured. Throughout this entire operation, the shape of the course shall be maintained by blading and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lines and grades.
        2) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping, and recompacting by sprinkling and rolling.
        3) All irregularities, depressions or weal spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.
    2. When the ADensity Control@ method of compaction is to be used, the following provisions shall apply:
        1) The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as hereinafter specified under ADensity@.
        2) In addition to the requirement specified for density, the full depth of the flexible base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment.
        3) After each section of flexible base is completed, tests as necessary will be made by the ENGINEER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet this requirements.
        4) Throughout this entire operation, the shape of the course shall be maintained blading, and the surface upon completion shall be smooth and in conformity with the typical sections shown on the plans and to established lined and grades.

5) In that area on which pavement is to be placed, any deviation in excess of 1/4 inch in cross section in a length of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.
6) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

9. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete, it shall be recompacted and refinished at the sole expense of the CONTRACTOR.
10. Where Type C material is used, the material shall be scarified, thoroughly wetted, mixed, manipulated, and bladed so as to secure a uniformly wetted material, and pulled in over the subgrade in courses and set under the action of blading and rolling. The work of mixing, blading, rolling, shaping and subsequent maintenance shall be performed by the continuous use of sufficient number of satisfactory rollers and power maintainers with adequate scarifier attachments.

3.03 PLACEMENT OF FIRST COURSE – TYPE D MATERIAL:

1. Immediately before placing the base material, the subgrade shall be checked as to conformity with grade and section, and corrections made if necessary.
2. All materials shall be delivered in approved vehicles of a uniform capacity.
3. The required amount of shell shall be uniformly spread across the section and allowed to dry sufficiently to insure proper slaking and mixing of the binder material. Immediately upon completion of the drying period, as determined by the ENGINEER, the specified amount of sand admixture as produce a combined material meeting the requirements hereinbefore specified, shall be spread uniformly across the shell.
4. The material shall then be sprinkled as required and thoroughly mixed by blading and harrowing, or other approved methods.
5. Failure to proceed with the placing of sand admixtures or mixing and placing operations will be grounds for the suspension of placing of shell.
6. Under no condition will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.
7. The course shall be compacted by the method of compaction hereinafter specified as the AOrdinary Compaction@ method of the ADensity Control@ method of compaction as indicated on the plans, or as directed by the ENGINEER.
    1. When the plans indicate that the AOrdinary Compaction@ method is to be used, the following provisions shall apply:
        1) After mixing, all material shall be windrowed, and then spread over the section in layers.
        2) The layer shall not exceed 2 inches in loose depth.
        3) If necessary to prevent segregation, the material shall be wetted in the window prior to spreading.
        4) After each lift is spread, it shall be sprinkled and rolled to secure maximum compaction as directed by the ENGINEER. Succeeding layers shall then be placed similarly until the course is completed.
        5) All areas and nest of segregated coarse or fine material shall be corrected or removed and replaced with well graded material, as directed by the ENGINEER.
        6) The course shall then be sprinkled as required and rolled as directed until a uniform compaction is secured.
        7) Throughout this entire operation, the shape of the course shall be maintained by blading,; and the surface, upon completion, shall be smooth and in conformity with the typical sections shown on the plans, and to the established lines and grades.
        8) In that area on which pavement is to be place, any deviation in excess of 1/4 inch in cross section in a length of 16-feet measured longitudinally shall be corrected by

loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

9) All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

2. When the plans indicate that the ADensity Control@ method of compaction is to be used, the compaction method shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G materials.

8. When indicated on the plans or permitted by the ENGINEER, Type D material may be mixed in a central mixing plant and delivered to the road as a combined mixture. When this method is used, the combined mixture shall meet the requirements for Type D material as hereinbefore specified and the placing and compaction requirement shall be the same as prescribed for Type A, Type B, Type C, Type F and Type G material.

3.04 PLACEMENT OF FIRST COURSE-TYPE E MATERIAL

1. The construction methods for placing the first course of Type E material shall be the same as prescribed for Type D material except that after the shell and sand have been placed, the prescribed amount of caliche shall then be spread across the sand and shell.
2. The composite mixture shall than be sprinkled as required and thoroughly mixed by blading and harrowing or other approved methods.
3. Compaction of the first course of Type E material shall be the same as prescribed above for Type D material.
4. Failure to proceed with placing the sand and caliche admixture or mixing and placing operations will be grounds for the suspension of placing the shell.
5. Under no conditions will the CONTRACTOR be allowed to place an excessive amount of shell without proceeding with the mixing and placing operations.

3.05 PLACEMENT OF SUCCEEDING COURSES – ALL MATERIAL TYPES:

1. Construction methods shall be the same as prescribed for the first course.
2. Prior to placing the surfacing on the completed base, the base shall be Adry cured@ to the extent directed by the ENGINEER.

3.06 DENSITY CONTROL:

1. When the ADensity Control@ method of compaction is indicated on the plans, each course of flexible base shall be compacted to the percent density shown on the plans.
2. The testing will be as outlined in Test Method Tex- I 14-E.
3. It is the intent of this specification to provide in that part of the base included in the top 8 inches immediately below the finished surface of the roadway not less than 100 percent of the density as determined by the compaction ratio method.
4. Field density determination shall be made in accordance with Test Method Tex115-E.

3.07 TOLERANCES:

1. Flexible base will be measured by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.
    1. The ENGINEER may accept the work providing not more than 25 percent of the density tests performed each day are outside the specified density by no more than three pounds per cubic foot and where no two consecutive tests on continuous work are outside the specified limits.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

1. Flexible base will be measure by the square yard of surface area of completed and accepted work based on the width of flexible base as shown on the plans.
    1. The flexible base shall be measured for depth by the units of 2000 square yards, with one measurement taken at location selected by the ENGINEER.
    2. In that unit where flexible base is deficient by more than 2 inch in thickness, the deficiency shall be corrected by scarifying, adding material as required, reshaping and recompacting by sprinkling and rolling.
    3. No additional payment over the contract unit price will be made for any flexible base of a thickness exceeding that required by plans.
2. The CONTRACTOR shall schedule his operations in such a manner as to facilitate the measurement of the pay item.
3. The ENGINEER may accept the work provided no more than 2 out of 10 depth tests performed are deficient by not more 2 inch and where no two consecutive tests on continuous work are outside the specified depth.

4.02 PAYMENT:

1. The accepted quantities of flexible base of the type, grade, and compaction method specified will be paid at the contract unit bid price per square yard, complete in place.
2. Where ordinary Compaction is used, all sprinkling, rolling, and manipulation required will not be paid for directly, but will be incidental to other bid items.
3. The unit prices bid shall each be full compensation for shaping and fine grading the roadbed; for securing and furnishing all materials, including all royalty and freight involved, for furnishing scales and labor involved in weighing the material when required; for loosening, blasting, excavating, screening, crushing and temporary stockpiling when required; for loading all materials for all hauling and delivering on the road; for spreading, mixing, blading, dragging, shaping and finishing and for all manipulation, labor, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 02610 — PRIME COAT

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 GENERAL DESCRIPTION

1. Prime coat shall consist of application of asphaltic materials on completed base course and/or other approved area, which shall be applied in accordance with these specifications, as shown on the plans, and as directed by the ENGINEER.

1.03 QUALITY ASSURANCE

1. Test and Certification of Bituminous Materials.
    1. Bituminous material is to be tested in accordance with the requirements of AASHTO M-82 and sampled in conformance with AASHTO T-40.
    2. Supply, at the time of delivery of each shipment of asphalt, two certified copies of test reports, from supplying vendor, to the ENGINEER.
    3. Test reports shall indicate name of vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and result of specified tests.
    4. The test report, signed by an authorized representative of the vendor, shall certify that the product delivered conforms to the specifications for type and grade indicated.
    5. Certified test reports and the testing required in the preparation of such report shall be at no cost to the City.
    6. Final acceptance of bituminous materials shall be dependent on the determination by the ENGINEER that the material meets prescribed standards.

PART 2 - PRODUCTS

2.01 MEDIUM CURING CUTBACK ASPHALT

1. Medium-curing liquid asphalt, designated by the letters MC, shall consist of an uncracked petroleum bast stock, produced by the processing of asphaltic or semi asphaltic base crude petroleum, blended with a kerosene-type solvent. The base stock for all MC materials shall be straight run asphalt produced within the penetration range of 100 to 300, and the end point of the kerosene type solvent shall not exceed 525 degrees F. Medium curing liquid cutback asphalt shall be free from water and show no separation.

2. Medium curing cutback asphalt shall consist of materials specified above and conforming to the requirements set forth in Table 26 10- 1.
3. Unless otherwise noted on the plans or directed by the ENGINEER, cutback asphalt Grade MC-30 shall be used.

2.02 BLOTTER MATERIAL:

1. Supply blotter material consisting of native and/or sweeping from base course.
2. Native sand shall be local material obtained from approved sources as approved by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION METHODS

1. Unless otherwise specified on the plans or, required by the ENGINEER, only asphaltic material shall be used. Where required, a combination of asphaltic and blotter material shall be used.
2. Application of Asphaltic Materials Only.
    1. Apply prime coat to prepared surface when ambient air temperature is above 40 degrees F. and raising and shall not be applied when the ambient air temperature is below 50 degrees F. and falling.
    2. Apply prime coat to surfaces that have been cleaned by sweeping or other approved methods and where base is thoroughly dry and satisfactory for receiving prime coat.
    3. Apply prime coat to cleaned base, at a rate of 0.2 to 0.5 gallons per square yard of surface area, using an approved type of self-propelled pressure distributor so constructed and operated to distribute the material evenly and smoothly.
    4. Provide necessary facilities for the determination of temperature of asphaltic material in all heating equipment and distributors; and for determination of rate at which it is applied; and for securing uniformity at the junction of two distributor loads.
    5. Keep in clean and good working condition all storage tanks, piping, reports, booster tanks and distributors used in the storage and handling of asphaltic materials.
    6. Operate all associated equipment in a manner such that there is no contamination of asphaltic material with foreign material.
    7. Calibrate distributor and furnish ENGINEER with an accurate and satisfactory record of such calibrations.

TABLE 2610-1

Specification Designation	AASHTO Test Method	ASTM Test Method	MC 30	MC 70	MC 250	MC 800	MC 3000
Flash Point (Open Cleve) oF, Min.	T 48	D 92	100	100	150	150	150
Viscosity 140oF, Kinematic, CS	T 201	D2170	30 to 60	70 to 140	250 to 500	800 to 1600	3000 to 6000
Furol Viscosity at 77 F. (Secs.)	T 72	D 88	75-150				
at 122 F. (Secs.)				60-120			300 to 600
at 140 F. (Secs.)					125-250		
at 180 F. (Secs.)						100-200	
Distillation Distillate (% of	T 78	D 402					

Total Distilate) to 680 F. to 437 F. to 500 F. to 600 F.			 0-25 40-70 75-93	 0-20 25-60 75-90	 0-10 20-55 70-85	 -0- 10-35 65-80	 -0- 0-15 50-75
Residue from Distillation to 680 F Volume % by Difference Min.			50	55	67	75	80
Test on Residue From Distillation Penetration at 77 F.	T 49	D 5	120 to 250	120 to 250	120 to 250	120 to 250	120 to 250
*Ductility 77 F cm., Min.	T 51	D 113	100	100	100	100	100
Solubility in CC14, % Min.	T 44	NONE	99.5	99.5	99.5	99.5	99.5
Water, % Min.	T 55	D 95	0.2	0.2	0.2	0.2	0.2
Reaction to Spot Test	T 102**	-0-		-0-	-0-	-0-	-0-

* If penetration of residue is more than 200 and its ductility at 77° F is less than 100, the material will be acceptable if the ductility at 60° F is greater than 100.

** Using 85% Standard Nephtha and 15% Xylene

NOTE: Viscosity tests may be made by either Kinematic or Furol test methods.

8. Recalibrates distributor, in a manner satisfactory to the ENGINEER, after the beginning of work, should the yield on the asphaltic material applied appear to be in error.
9. No traffic, hauling or placing of subsequent courses shall be permitted over fleshy applied prime coat until authorized by the ENGINEER.
10. Apply asphaltic material at a temperature within 15° F of temperature of application selected by the ENGINEER based on temperature viscosity relationship noted in Table 2610- 1.
11. Maintain surface until work is Blotter Material.

3. Application of Asphaltic and Blotter Material.
   1. Haul blotter material in vehicles of uniform capacity and placedon shoulders at spacings designated by the ENGINEER.
   2. After application of asphaltic material as specified above, cover surface with blotter material as directed by the ENGINEER.
   3. After application of blotter material, drag surface with approved drag broom, evenly and smoothly distributing the blotter material. Brooming or dragging operation shall continue, as directed by the ENGINEER, until the course has properly cured under traffic.

PART 4 - MEASUREMENT AND PAYMENT

4.01 PRIME COAT

1. Asphaltic material for prime coat will be measured for payment at point of delivery on the project in gallons at applied temperature.

2. When not listed as a separate contract pay item, prime coat shall be considered as incidental work, and the cost thereof shall be included in such contract pay item(s) as are provided in the proposal contract.
3. Compensation, whether by contract pay item or incidental work will be for furnishing all material, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.

4.02 BLOTTER MATERIALS

1. Blotter mater will be considered to asphaltic material for prime coat with no direct payment or payment therefore.

END OF SECTION

SECTION 02612 — HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 DESCRIPTION

1. Hot mix asphalt concrete (HMAC) pavement shall consist of a binder course, a leveling up course, a surface course or a combination of the courses as shown on the plans, or as directed by the ENGINEER.
2. HMAC pavement shall be composed of a compacted mixture of mineral aggregated and asphaltic material, constructed on previously completed and approved subgrade, subbase course, base course, or existing pavement.
3. HMAC pavement shall be in accordance with the specifications herein and in conformity with the lines, grades, quantities, and typical sections in the contract and/or as directed by the ENGINEER.

1.03 QUALITY CONTROL

1. HMAC pavement and its constituent part shall conform to the ASTM, AASHTO and/or Texas SDHPT test methods noted below.

PART 2 - PRODUCTS

2.01 ASPHALTIC MATERIALS

1. Asphalt cement binders shall be uncracked petroleum asphalt and shall be carefully refined, be steam, vacuum, or solvent, from asphaltic or semiasphaltic base crude petroleum at a temperature not to exceed 700 degrees F. Asphalt cements shall be free from thermal decomposition products and shall not be blended with any materials which have been subject to cracking or produced from a crude petroleum source other than that of the original sources. Asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347 degrees F.
2. Paving asphalt shall be classified by penetration or viscosity and shall conform to the requirements set fort in one of the following tables as designated by the ENGINEER. The CONTRACTOR may supply asphalt meeting the requirements of one of the following tables provided that he obtains prior approval of the ENGINEER and with the provision that once approval has been obtained, that the CONTRACTOR will remain with that grade throughout the project.

TABLE 02612-1								
Specification Designation	AASHTO Test Method	ASTM Test Method	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Flash Point (Open Cup) Min.	T 48	D 92		450	450	450	425	350
Penetration of Orig. Sample at 77 F	T 49	D 5	40 to 50	60 to 70	85 to 100	120 to 150	150 to 200	200 to 250
Thin-Film Oven Loss, Hours at 325 F, % Max	T 179	D 1754	0.75	0.75	0.75	0.75	1.00	1.00
Test of Residue from Thin-Film Oven Test: % of Orig. Pen., Min.	T 49	D 5	52	50	50	50	50	50
Ductility at 77 F, cm. after Loss at 325 F, Min.	T 51	D 113	50	50	100	100	100	100
Solubility in CC14, % Min.	T 44*	NONE	99.5	99.5	99.5	99.5	99.5	99.5
Reaction to Spot Test	T 102**	NONE	-0-	-0-	-0-	-0-	-0-	-0-

*Procedure No. 1 with CC1 4 substituted for CS2.

**Using 85% Standard Nephtha and 15% Xylene.

TABLE 02612-2						
TYPE-GRADE	OA-30		OA-175*		OA-400	
	Min.	Max.	Min.	Max.	Min.	Max.
Penetration at 32 F, 200g., 60 sec.	15	--	B	B	B	B
Penetration at 77 F, 100g., 5 sec.	25	35	150	200	B	B
Penetration at 115 F, 50g., 5 sec.	B	65	B	B	B	B
Ductility at 77 F, 5 Original OA	2	B	70	B	B	B
Flash Point C.O.C., F.	450	B	425	B	425	B
Softening Point, R & B.,F.	185	B	95	130	B	B
Thin Film Oven Test, 1/8 in Film 50 g., 5hrs., 325 F, % Loss by wt	B	0.4	B	1.4	B	2.0
Penetration of Residue, at 77 F, 100g., 5 sec. % of Original Pen	B	B	40	B	B	B
Ductility of Residue at 77 F, 5 cm/min., cms	B	B	B	100	B	B
Solubility in Trichloroethylene, %	99.0	B	99.0	B	99.0	B
Spot Test on Original OA	Neg.		Neg.		Neg.	
Float Test at 122 F, sec	B	B	B	B	120	150
Test on 85 to 115 Pen. Residue* Residue by Wt., %	B	B	B	B	75	B
Ductility, 77 F, 5 cm/min: Original Res., cms	B	B	B	B	100	B
Subjected to Thin Film Test, cms	B	B	B	B	100	B

*Determined by Vacuum Distillation (by evaporation if unable to reduce by vacuum).
**For use with Latex Additive only.

TABLE 02612-3						
PROPERTIES	AC-1.5 MIN.MAX.	AC-3 MIN.MAX.	AC-5 MIN.MAX.	AC-10 MIN.MAX.	AC-20 MIN.MAX.	AC-200 MIN.MAX.
Viscosity, 140 F stokes	150 50	300 100	500 100	1000 200	2000 400	4000 800
Vistrosity, 275 F stokes	0.7 B	1.1 B	1.4 C	1.9 B	2.5 B	3.5 B
Penetration 77 F 100 g, 5 sec.	250 B	210 B	135 B	85 B	55 B	35 B
Flash Point, C.O.C., F.	425 B	425 B	425 B	450 B	450 B	450 B
Solubility in trichloroethylene, percent	99.0 B	99.0 B	99.0 B	99.0 B	99.0 B	99.0 B
Test on residues from thin film oven test: Viscosity, 140 F stokes	B 450	B 900	1500 B	3000 B	6000 B	B 12000
Ductility, 77 F, 5 cms per min, cms	100 B	100 B	100 B	70 B	50 B	30 B
Spot Test	Negative on all grades					

3. A minimum of two percent, by weight, latex additive (solids basis) shall be added to the OA- 175 Asphalt or to AC-5 Asphalt when specified in the contract. The latex additive shall be governed by the following specifications.

   The latex is to be an anionic emulsion of butadiene-styrene low-temperature copolymer in water, stabilized with fatty-acid soap so as to have good storage stability, and possessing the following properties:

   Monomer ratio, B/S …….. 70/30
   Minimum solids content .....……..... 76%
   Solids content per gal. @ 67%.……..... 5.3lbs
   Coagulum on 80-mesh screen ……... 0.01% max.
   Type Anti-oxidant…….. Staining
   Mooney viscosity of Polymer (M/L4@212F)…….100min.
   pH of Latex .....……. 9.4-10.5
   Surface tention…… 28-42 dynes/cm2

   The finished latex-asphalt blend shall met the following requirements:

   Viscosity at 140 F, stokes …… 1500 max.
   Ductility at 39.2 F 1cm per., cm……...…… 100 min.

1. Asphalt content shall be within the limits noted below:

HMAC Type	Percent of Mixture by Weight	Percent of Mixture by Volume
AA@	3.5-7.0	8.0-16.0
AB@	3.5-7.0	8.0-16.0
AC@	3.5-7.0	8.0-16.0
AD@	4.0-8.0	9.0-19.0
AF@	3.5-6.5	8.0-16.0

2. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the purchaser certified copies of the test report which shall indicate the name of the vendor, type and grade of asphalt delivered, date and point of delivery, quantity delivered, delivery ticket number, and results of the above specified tests. The test report shall be certified and signed by an authorized representative of the vendor that the product delivered conforms to the specifications for the type and grade indicated.
3. Until the certified test reports and samples of the material have been checked by the ENGINEER to determine their conformity with the prescribed requirement, the material to which such report relates and any work in which it may have been incorporated as in integral component will be only tentatively accepted by the Owner. Final acceptance will be dependent upon the determination of the ENGINEER that the material involved fulfills the requirements prescribed therefore. The certified test reports and the testing required in connection with the reports will be at the expense to the Owner.
4. Unless otherwise specified in these specifications or in the Supplementary Specifications, the various grades of paving asphalt shall be applied at a temperature range between 225 to 350E F, the exact temperature to be determined by the ENGINEER.
5. Paving asphalt shall be heated in such a manner that stream or hot oils will not be introduced directly into the paving asphalt during heating. The CONTRACTOR shall furnish and keep on the site, at all times, an accurate thermometer suitable for determining the temperature of the paving asphalt.
6. HMAC asphalt shall be the grade having the highest penetration, within specified limits, to produce a mix having a maximum stability of the compacted mixtures.
7. Only one (1) grade of asphalt shall be required unless otherwise shown on the plans or as required by the ENGINEER.

2.02 AGGREGATES

1. HMAC aggregate will be tested in accordance with the following test.

AASHTO T-30	Mechanic Testing
AASHTO T-27	Passing No. 200 Sieve
AASHTO T-89	Liquid Limit
AASHTO T-96	Los Angeles Abrasion
AASHTO T-104	Soundness (Magnesium Sulfate)
ASTM C – 131	Resistance to Degradation
ASTM C – 136	Sieve Analysis
ASTM C – 2419	Sand Equivalence Value
SDHPT Tex-106-E	Method of Calculating Plasticity Index of Solids
SDHPT Tex-217-F	(I & II) Determination of Deleterious Materials and Decantation Test
SDHPT Tex-203-F	Quality Tests for Mineral Aggregates

2. Aggregates shall have an abrasion of not more than 40 for all course except the non-skid surface course, which shall have an abrasion of not more than 35.
3. When property proportioned, HMAC aggregate shall produce a gradation, which will conform to the limitations for classification for HMAC type shown below, or as directed by the ENGINEER.
4. Course aggregate to be crushed limestone rock or crushed gravel with hydrated lime or limestone filler. (Crushed gravel shall be per Highway Department Specifications.)

5. Binder aggregate to be composed of 15% crushed limestone screening or as directed by the ENGINEER.

1. Type AA@ - Course Graded Base Course

	Percent Aggregate by Weight or Volume
Passing 2" sieve	100
Passing 1-3/4" sieve	95 to 100
Passing 1-3/4"sieve, retained on 7/8" sieve	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No. 10 sieve, retained on No. 40 sieve	5 to 21
Passing No. 40 sieve, retained on No. 80 sieve	3 to 16
Passing No. 80 sieve, retained on No. 200 sieve	2 to 16
Passing No. 200 sieve	1 to 8

2. Type AB@ - Fine Graded or Leveling-Up Course

	Percent Aggregate by Weight or Volume
Passing 1" sieve	100
Passing 7/8" sieve	95 to 100
Passing 1-3/4" sieve, retained on 7/8" sieve	16 to 42
Passing 7/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	10 to 26
Passing No. 40 sieve, retained on No. 10 sieve	5 to 21
Total retained on No. 10 sieve	68 to 84
Passing No. 10 sieve, retained on No. 40 sieve	5 to 21
Passing No. 40 sieve, retained on No. 80 sieve	3 to 16
Passing No. 80 sieve, retained on No. 200 sieve	2 to 16
Passing No. 200 sieve	1 to 8

3. Type AC@ - Course Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 7/8" sieve	100
Passing5/8" sieve	95 to 100
Passing 5/8" sieve, retained on 3/8" sieve	16 to 42
Passing 3/8" sieve, retained on No. 4 sieve	11 to 37
Passing No. 4 sieve, retained on No. 10 sieve	11 to 32
Total retained on No. 10 sieve	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve	3 to 27
Passing No. 200 sieve	1 to 8

4. Type AD@ - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 2" sieve	100
Passing3/8" sieve	85 to 100
Passing 3/8" sieve, retained on No. 4 sieve	21 to 53

Passing No. 4 sieve, retained on No. 10 sieve ……..	11 to 32
Total retained on No. 10 sieve ……..	54 to 74
Passing No. 10 sieve, retained on No. 40 sieve ……	6 to 32
Passing No. 40 sieve, retained on No. 80 sieve ……	4 to 27
Passing No. 80 sieve, retained on No. 200 sieve ……..	3 to 27
Passing No. 200 sieve ……..…..	1 to 8

5. Type AF@ - Fine Graded Surface Course

	Percent Aggregate by Weight or Volume
Passing 3/8" sieve ……..	100
Passing No. 4 sieve ……	95 to 100
Passing No. 4 sieve, retained on No. 10 sieve ……...	58 to 73
Passing No. 10 sieve, retained on No. 40 sieve …….	6 to 26
Passing No. 40 sieve, retained on No. 80 sieve …….	3 to 13
Passing No. 80 sieve, retained on No. 200 sieve ……...	2 to 11
Passing No. 200 sieve ……	1 to 8

2.03 PRIME COAT

1. Prime coat, when specified on the plans, or as directed by the ENGINEER, shall be in accordance with Section 02610 - Prime Coat, and as specified herein.
2. Prime coat shall be applied to surfaced of based at least 12 hours prior to placing the HMAC unless otherwise directed by the ENGINEER.
3. Asphalt prime shall be applied uniformly at the rate of 0. 10 to 0.30 gallon per square yard or as directed by the ENGINEER. It shall be applied only when permitted by the ENGINEER and when the air temperature is not less than 40 F.
4. In order to prevent lapping at the junction of two applications, the distributor shall be promptly shut off. A hand spray shall be used to touch up all spots unavoidably missed by the distributor.
5. Immediately prior to application of the asphalt prime, an inspection will be made by the ENGINEER to verify that the base course has been constructed as specified. Also, all loose and foreign material shall be removed by light sweeping. Material so removed shall not be mixed with cover aggregate.
6. The surface to be primed shall be in a smooth and well-compacted condition, true to grade and cross section, and free from ruts and inequalities.
7. The pressure distributor used for applying prime coat material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the prime material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a speed tachometer registering feet per minute and so located as to be visible to the truck driver to enable him to maintain the constant speed required for application at the specified rate.
8. The pressure distributor shall be equipped with a tachometer registering the pump seed, pressure gauge, and a volume gauge. The rates of application shall not vary from the rates specified by the ENGINEER by more than 10%. Suitable means for accuracy indicating at all times the temperature of the prime material shall be provided. The thermometer well shall be so placed as not to be in contact with a heating tube.
9. The distributor shall be so designed that the normal width of application shall be not less than 6 feet, with provisions for the application of lesser width when necessary. If provided with heating attachments, the distributor shall be so equipped and operated that the prime material shall be circulated or agitated through the entire heating process.
10. The asphalt prime coat should preferably be entirely absorbed by the base course and, therefore, require no sand cover. If, however, it has not been completely absorbed prior to the start of placing

the asphalt concrete mixture and in the meantime it is necessary to permit traffic thereon, just sufficient sand shall be spread over the surface to blot up the excess liquid asphalt and prevent picking it up under traffic. Also, sand shall be used in areas where traffic may pass over the prime coat. Prior to placing the asphalt concrete, loose or excess sand shall be swept from the base. If a sand cover is specified in the Supplementary Specifications or noted on the plans to cover asphalt prime, it shall be applied within 4 hours after the application of said prime coat, unless otherwise ordered by the ENGINEER.

11. Liquid asphalt shall be prevented from spraying upon adjacent pavements, structures, guard rails, guide posts, culvert markers, trees, and shrubbery that are not to be removed; adjacent property and improvements; and other facilities or that portion of the traveled way being used by traffic.
12. The CONTRACTOR shall protect the prime coat against all damage and markings, both form other traffic. Barricades shall be placed where necessary to protect the prime coat. If, after prime coat has been applied satisfaction on the ENGINEER and has been accepted by him, it is distributed by negligence on the part of the CONTRACTOR, it shall be restored at his expense to its condition at the time of acceptance. No material shall be placed until the prime coat is in a condition satisfactory to the ENGINEER.

2.04 TACK COAT:

1. It the asphalt concrete pavement is being constructed directly upon an existing hard-surfaced pavement, a tack coat shall be evenly and uniformly applied to such existing pavement preceding the placing of the asphalt concrete. The surface shall be free of water, all foreign material, or dust when the tack coat is applied. No greater area shall be treated in any one day than will be covered by the asphalt concrete during the same day. Traffic will not be permitted over tack coating.
2. Tack coat for HMAC shall consist of either rapid curing cut-back asphalt RC-2 diluted by addition of (not to exceed 15 percent by volume) an approved grade of gasoline and/or kerosene; emulsified asphalt, EA- 11 M diluted with 50 percent water, or a cut-back asphalt made by combining 50 to 70 percent of the asphaltic materials specified for the paving mixture with 30 to 50 percent gasoline and/or kerosene by volume.
3. Tack coat shall conform to the requirements of Section 02620 - Tack Coat or as specified herein.
4. Application rate shall be 0. 10 to 0. 15 gallons per square yard as directed by the ENGINEER.
5. A similar tack coat shall be applied to the surface of any course if, in the opinion of the ENGINEER, the surface is such that a satisfactory bond cannot be obtained between it and the succeeding course.
6. When required, the contact surfaces of all cold pavement joints, curbs, gutters, manholes, and the like shall be painted with a tack coat immediately before the joining asphalt concrete is placed. Asphalt tack coat shall be applied in controlled amounts as shown on the plans or determined by the ENGINEER. Surfaces where tack coat is required shall be cleaned to the satisfaction of the ENGINEER before the tack coat is applied.

2.05 MINERAL FILLER:

1. Mineral filler, other than hydrated lime, shall consist of a thoroughly dry stone dust, portland cement or other mineral dust approved by the ENGINEER.
2. The mineral filler shall be free from foreign or other deleterious matter.
3. When tested by the method outlined in SDHPT Test Method Tex-200 F (Part 102 3), mineral filler shall meet the following gradations by weight:

Passing No. 30 Sieve	95-100%
Passing No. 80 Sieve	75%
Passing No. 200 Sieve	55%

2.06 Anti- striping compound, as required in the job mix formula, shall be furnished in the amounts calculated therein.

2.07 JOB MIX FORMULA:

1. A job mix formula based on representative samples, including filler if required, shall be determined by the ENGINEER, or submitted by the CONTRACTOR for approval of the ENGINEER.
2. The resultant job mix formula for shall be within the master range for the specified type of HMAC.
3. The job mix formula for each mixture shall established a single percentage of aggregate passing each required sieve size, and a single percentage of bituminous material to be added to the aggregate and shall provide for 3 to 5% air avoids in the resultant design mix. During the mix design process the ENGINEER will consider other factors, in addition to air voids and Marshall stability, such a durability, water resistance and asphalt film thickness when developing the mix design.
4. After the job mix formula is established, mixtures for the project shall conform thereto within the following tolerance, which may fall outside of the specified master range.

Percent by Weight or Volume as Applicable

Passing 1-3/4" sieve, retained on 7/8" sieve ……..…….. Plus or minus 5
Passing 7/8" sieve, retained on 3/8" sieve ……...……. Plus or minus 5
Passing 5/8" sieve, retained on 3/8 ……...…… Plus or minus 5
Passing 3/8" sieve, retained on No. 4 sieve ……..…. Plus or minus 5
Passing No. 4 sieve, retained on No. 10 sieve ……..…… Plus or minus 5
Total retained on No. 10 sieve ……..…… Plus or minus 5
Passing No. 10 sieve, retained on No. 40 sieve ……..…….. Plus or minus 3
Passing No. 40 sieve, retained on No. 80 sieve ……..…….. Plus or minus 3
Passing No. 80 sieve, retained on No. 200 sieve ……..…… Plus or minus 3
Passing No. 200 sieve ……... Plus or minus 3

Asphaltic Material ……..…...… Plus or minus 0.05 by wt or 1.2 by vol.

Mixing Temperature ……..…… Plus or minus 20 F

5. Asphaltic mixture shall be tested in accordance with SDHPT Test Method Tex200-4 (Part I or Part 111) and shall have the following laboratory values:

	Surface Course	**Base Course**
Density - Minimum	95%	95%
- Maximum	99%	99%
- Optimum	97%	97%
Stability – (Hveenm)		
Minimum	30%	30%
Maximum	45%	45%
Stability (Marshall – 75 Blow Briquette)	1500 lbs.	1500 lbs.
Voids	3 - 7%	4 - 7%
Voids Filled With Asphalt	75-85%	65-80%
Sand Equivalent	40	40

2.08 EQUIPMENT:

1. All equipment for the handling of all material, mixing, and placing of HMAC shall be in accordance with the provisions of Texas SDHPT Item 340.

2.09 STOCKPILING, STORAGE, PROPORTIONING AND MIXING:

1. Stockpiling, storage, proportioning and mixing operations shall be in accordance with the Provisions of Texas SDHPT Item 340.

PART 3 - EXECUTION

3.01 WEATHER AND TEMPERATURE LIMITATIONS:

1. Asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall not be placed when the air temperature is 50 F and falling, but may be placed when the air temperature is 40 F and rising.
2. Asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is 60 F and falling, but may be placed when the air temperature is 50 F and rising.
3. Mat thickness of I> inches or less shall not be placed when the temperature on which the mat is to be laid is below 50 F.
4. No tack or asphaltic mixture shall be placed when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the ENGINEER, are unsuitable.
5. If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture is 50 F or more below the temperature established by the ENGINEER, all or any part of the load may be rejected and payment will not be made for the rejected material.

3.02 EQUIPMENT:

1. Hauling Equipment:
    1. Trucks used for hauling asphaltic mixtures shall have tight, clean, smooth metal beds, which have been thinly coated with a minimal amount of paraffin oil, lime, slurry, tine solution or other approved material to prevent mixture adhesion to the bed.
    2. The dispatching of hauling equipment shall be arranged so that all material delivered may be placed and all rolling completed during daylight hours, unless otherwise directed by the ENGINEER.
    3. All trucks shall be equipped with a cover of canvas, or other suitable material to protect the mixture from weather or on hauls where the temperature of the mixture will fall below specified level. Use of covers will be as directed by the ENGINEER.
2. Rollers:
    1. Pneumatic Tile Roller. This roller shall consist of not less than seven pneumatic tire wheels, running on axles in such a manner that the rear group of tires shall cover the entire gap between adjacent tires of the forward group; mounted in a rigid frame; and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such manner that the roller may be turned within a minimum circle. The tire shall afford surface contact pressures up to 90 pounds per square inch or more. The roller shall be so constructed as to operate in both a forward and a reverse direction with suitable provisions for moistening the surface of the tires while suitable provisions for moistening the surface of the tires while operating; and shall be approved by the ENGINEER.
    2. Two Axle Tandem Roller. This roller shall be acceptable power-driver, steel-wheel, tandem roller weighing not less than eight tons. It must operate in forward and reverse directions; contain provision for moistening the surface of the wheels while in motion; and shall be approved by the ENGINEER.
    3. Three Wheel Roller. This roller shall be an acceptable power-driven, all steel three-wheel roller weighing not less than 10 tons. It must operate in forward and reverse directions; contain provisions for moistening the surface of the wheel while in motion; and shall be approved by the ENGINEER.

4. Vibratory Steel Wheel Roller. If approved for use by the OWNER, this roller shall have a minimum weight of six tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used. If shall be operated in accordance with a manufacturers recommendations.

3. Straight Edges:
   1. The CONTRACTOR shall provide an acceptable 16-foot straight-edges for surface testing. Satisfactory templates shall be provided as required by the ENGINEER.
4. Spreading and Finishing Machine:
   1. Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or a strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thickness shown on the plans.
   2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed. Design will be such that no part of the truck weight will be supported by the paver.
   3. The screed of strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture. The screed shall be adjustable for both height and crown and shall be equipped with a controlled heating device.
   4. The bituminous paver shall be equipped with an automatic leveling device controlled from an external guide. The initial pass for each course shall be made using a paver equipped with a 40-foot minimum external reference, except that this requirements will not apply when asphalt concrete is placed adjacent to portland cement concrete pavement. Subsequent passes may utilize the matching device of one-foot minimum length riding on the adjacent lay.

3.03 CONSTRUCTION METHODS:

1. Spreading and Finishing:
   1. The asphalt concrete mixture shall be laid on the approved surface, spread and struck off the grade and elevation established. It shall be spread and compacted in layers as shown on the plans or as directed by the ENGINEER. Bituminous pavers shall be used to distribute the mixture either over the entire width or over such partial width as may be practicable.
   2. The ENGINEER will determine a minimum placement temperature within a range from 220 F to 300 F which will produce the required density. The established placement temperature, which is measured immediately behind the laydown machine, shall not vary more than 20 F.
   3. A conventional paver or suitable equipment approved by the ENGINEER may be used to place asphalt concrete material on shoulders depressed from the traveled lanes in order to establish a uniform typical section. Approval of the equipments used will be based upon the result obtained.
   4. The asphalt concrete may be dumped from the hauling vehicles directly into the paving machine or it may be dumped upon the surface being paved and subsequently loaded into the paving machine; however, no asphaltic concrete shall be dumped from the hauling vehicles at a distance greater than 250 feet in front of the paving machine. When asphaltic concrete is dumped first upon the surface being paved, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphaltic concrete dumped all be picked up and loaded into the paving machine.
   5. To achieve, as far as practicable, a continuous operation, the speed of the paving machine shall be coordinated with the production of the plant. Sufficient hauling equipment shall be available to insure continuous operation.
   6. The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternately when directed, by controlling the elevation of each end

independently, including any screed attachment used for widening, etc. Failure of the control system to function properly shall be cause for the suspension of the asphaltic concrete operations.

7. When dumping directly into the paving machine from trucks, care shall be taken to avoid jarring the machine or moving it out of alignment.
8. All course of asphaltic concrete shall be placed and finished by means of self-propelled paving machines except under certain conditions or at certain locations where the ENGINEER deems the use of self-propelled paving machines impracticable.
9. Self-propelled paving machines shall spread the asphaltic concrete without segregation or tearing within the specified tolerances, true to the line, grade, and crown indicated on the plans. Pavers shall be equipped with hoppers and augers which will place the asphaltic concrete evenly in from of adjustable screeds without segregation. Screeds shall include any strike-off device without tearing, shoving or gouging the asphaltic concrete and which produces a finished surface of an even and uniform texture for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.
10. On areas where irregularities or unavoidable obstacles make use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, fluted and compacted with had tools. For such areas the mixture shall be dumped, spread and screed to give the required compacted thickness.

2. Compaction
   1. Rolling with the 3-wheel and tandem roller shall start longitudually at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels.
   2. Alternate trips of the roller shall be slightly different in length.
   3. Rolling with a pneumatic tired roller shall be as directed by the ENGINEER.
   4. Rolling shall continue with no further compression can be obtained and all roller marks are eliminated.
   5. The motion of the roller shall be slow enough at all times to avoid displacement of asphaltic materials. If displacement occurs, it shall be corrected immediately by use of rakes and fresh asphaltic mixtures, where required.
   6. The roller shall not be allowed to stand on the surface coarse when it has not been fully compacted and allowed to cool.
   7. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water; however, excess water shall not be allowed.
   8. All precautions shall be taken to prevent dripping of gasoline, oil, grease, or other foreign substances on the surface or base courses during rolling operations or while rollers are standing.
   9. With the approval of the ENGINEER, a vibratory steel wheeled roller by be substituted for the 3-wheel roller and tandem roller.
   10. Along forms, curbs, headers, walls and other places are accessible to the rollers, the mixture shall be thoroughly compacted with not hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.
   11. Any mixture that becomes loose, broken, mixed with dirt, segregated, or is in any way defective shall be removed and replaced with fresh hot bituminous mixture, which shall be compacted to conform with the surrounding area. Any area showing excess or deficiency of bituminous material shall be corrected immediately as directed by the ENGINEER.
3. In-Place Density
   1. In-place density shall be required for all mixtures except thin irregular depth leveling courses.
   2. Each course, after final compaction, shall have a density of not less than 95 percent of the density developed in the laboratory lest method outlined in Texas SDHPT Bulletin C- 14.
   3. Density shall be determined with a portable nuclear test device in conformity with ASTM D-2950, 76.

4. Calibration of the portable nuclear device will be established by the ENGINEER from cut pavement samples tested in accordance with AASHTO T- 166 (weight, volume method). The density readings of the cut pavement samples determined in accordance with AASHTO T- 166 (weight, volume method), and the density readings of the pavement samples determined by the portable nuclear test device in conformity with ASTM D 2950 will be correlated by the ENGINEER.
5. Other methods of determining in-place density may be used as deemed necessary by the ENGINEER.
6. It is intended that acceptance density testing will be done while the bituminous mixture is hot enough to permit further compaction if necessary. If the density of an acceptance section does not meet the specified requirements, the CONTRACTOR shall continue the compaction effort until the optimum density is obtained, but rolling for any compaction effort will not be allowed when the temperature of the mix is below 175 F unless authorized in writing by the ENGINEER. Rerolling the paved surface after it has initially cooled will not be allowed.
7. If in-place density test of the mixture produce a value lower than specified and in the opinion of the ENGINEER is not due to a change in the quality of the material, production may proceed with subsequent changes in the mix and/or construction procedures until in-place density equals or exceeds the specified density.
8. In-place density tests will be provided by the ENGINEER unless otherwise specified.

4. Joints
   1. Placing of asphalt concrete shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the ENGINEER.
   2. When plant mix bituminous pavement is placed over plant mix bituminous treated base or when plant mix seal coat is placed over plat mix bituminous pavement, longitudinal joints shall be staggered at least 6 inches with relation to the longitudinal joints of the underlying course.
   3. Transverse joints shall have a two-foot or 12:1 minimum taper. Longitudinal joints shall have a one-foot or 6:1 minimum taper. All traverse tapers shall be cut and squared off prior to commencing new work. Tapered longitudinal joints from previous operations shall be cleaned and tack coated if directed by the ENGINEER. All joints shall be completely bonded. The surface of each course at all joints shall be smooth and shall not show any deviations in excess of 3/16 of an inch when tested with a 10-foot straightedge in any direction.
   4. When paving under traffic the CONTRACTOR shall plan his daily surfacing operations on a schedule which will result in not more than one (1) day=s operation of exposed longitudinal joints. The longitudinal joints shall not have a height greater than two (2) inches and shall not be left exposed longer than 24 hours.
5. Surface Tolerance:
   1. Upon completion, the pavement shall be true to grade and cross section. Expect at intersections or any changes of grade, when a 16 foot straight edge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straight edge more that I/ I 6-inch per foot. Areas that are not within this tolerance shall not be brought to grade immediately following the initial rolling. After the completion of final rolling, the smoothness of the course shall be checked, and the irregularities that exceed the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material as directed by the ENGINEER at the expense of the CONTRACTOR.
6. Manholes and Valve Covers
   1. Manhole frames and valve covers shall be adjusted prior to placing the surface course.
7. Compacted Thickness of HMAC and Base Courses
   1. Surface Courses. The completed thickness or depth of the asphaltic concrete surface shall be shown on the plans. Where the plans require a depth or thickness of the surface course

greater than two inches compacted depth, same shall be placed in multiple coursed of equal depth, each of which shall be exceed two inches compacted depth. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any multiple courses, it shall be applied at a rate as directed.

2. Base Courses. The compacted thickness or depth of each base course shall not be shown on the plans. Where the plans require a depth or thickness of the course greater than 4 inches, same shall be accomplished by constructing multiple lifts of approximately equal depth, each of which shall not exceed these maximum compacted depths. If, in the opinion of the ENGINEER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as herein before specified at the rate as directed.

8. Pavement Thickness Tests
   1. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the ENGINEER or his authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost of the initial pavement thickness test shall be at the expense of the ENGINEER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR=S expense. The cost for the additional coring test shall be at the same rate charged be commercial laboratories.
9. Price Adjustment of Roadway Density
   1. The payment of the unit price will be adjusted for roadway density as outlined in the following table. The adjustment will be applied on a lot-by-lot basis for each lift. The adjustment will be based on the average of five density tests. The price adjustment will be applied to the entire asphalt concrete mix which includes the HMAC aggregate, the asphalt cement and anti-stripping compound, if used.

Average Density % of Lab Density	Percent of Contract Price to be Paid
Above 95.9	100%
94.0 to 94.99	96%
93.0 to 93.99	91%
92.0 to 92.99	85%
Less than 92.00	*

*This lot shall be removed and replaced to meet specification requirements as ordered by the ENGINEER. In lieu thereof, the CONTRACTOR and the ENGINEER may agree in writing that for practical purposes, the lost shall not be removed and will be paid for at 50% of the contract price.

PART 4 - MEASUREMENT AND PAYMENT

4.01 INCIDENTAL WORK

1. Prime coat, anti-stripping compound, where used and tack coat shall not be measured for direct payment, but shall be considered as subsidiary work pertaining to the placing of asphaltic mixtures of the contract price.

4.02 MEASUREMENT

1. Hot-mix asphalt concrete material shall be measured by the ton of 2,000 pounds or by the square yard of the type used in the completed and accepted work.

2. Weight shall be determined by a certified scale approved by the OWNER and recorded serially numbered weight tickets, identifying the vehicle and presented to the ENGINEER's representative on the job.

4.03 PAYMENT

1. Work performed and materials furnished, as prescribed by this item, measured as provided herein, shall be paid at the unit bid price per ton or square yard for the type or types of hot mix asphalt concrete pavement shown on the proposal.
2. Unit bid price shall be payment in full for quarrying; furnishing all materials; for all heating; mixing; hauling; cleaning existing base course or pavement; placing asphaltic mixtures; rolling and finishing; and for all labor, tools, equipment and incidentals necessary to complete the work, including the work and materials involved in the application of price coat and tack coat.

END OF SECTION

SECTION 02720 — SITE DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install storm sewer piping, collection boxes, grates, manholes, culverts, inlets and headwalls as indicated in the Architectural drawings and specified herein.

B. Related trenching, pipe bedding, backfill, and compaction as indicated in the Civil and MEP documents drawings and specified herein.

C. Trench safety in accordance with OSHA requirements and as specified **under Trench Safety Section.**

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Piping indicated on pluming drawings.

B. Site clearing, grading and filling.

1.4 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer’s literature for piping precast drainage structures and grates illustrating performance, fabrication procedures, materials and sizes.

B. Reference Section 01340 SUBMITTALS for additional submittal requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. CONCRETE SEWER PIPING: Extra strength tongue and groove pipe conforming to ASTM C-76, Class III for reinforced pipe.

B. JOINT SEALS:

1. Under 42" diameter: Provide Talcote Asphalt Primer No. 041 and Talcote Cold Plastic No. 052 joint compound.
2. 42" diameter and larger: Bell and rubber gasketed joints.

C. CONCRETE: Minimum compressive strength of 3,000 psi. Conform to requirements of Cast in Place Concrete Section 3.

D. POLYVINYL CHLORIDE (PVC) SDR 26 PIPING: Provide PVC piping where indicated on the drawings. Jointing shall be solvent weld or bell and gasket meeting requirements of A.S.T.M. 3212. Piping shall meet requirements of A.S.T.M. D-3034.

E. INLETS:

1. Precast concrete, cast in place concrete or brick collection boxes as indicated in the drawings. Brooks Products, or equivalent. Form both inner and outer walls for cast-in-place items.
2. Brick: ASTM C-32 sewer brick, Grade SS, 2-1/4" x 3-3/4" x 8".
3. Gratings, Covers and Frames: Cast iron, McKinley, Neenah or approved equal. Heavy duty in paving. Medium duty in walks. Light duty in grass or planting areas.

PART 3 - EXECUTION

3.1 INSTALLATION

A. INLETS:

1. All storm sewer inlets shall be constructed to the line and grade and at location shown on the drawings. Inlets shall be constructed in strict accordance with details as indicated in the drawings.
2. When the box section of the inlet has been completed, the floor of the inlet shall be shaped by filling with one-two mortar to conform to the section shown on the detail drawings.
3. Cast iron inlet frames and grates shall be accurately adjusted to line, grade and slope and grouted in place with mortar consisting of one part Portland Cement to two parts sand.

B. PIPING:

1. Inspection: Review drawings and job conditions and verify all inverts before trenching to avoid conflict with other below grade utilities either planned or existing. Immediately notify Architect of any apparent conflicts before beginning work.
2. Trenching: Provide trenching in strict compliance with current OSHA regulations and in accordance with **Trench Safety Section. Do not trench ahead of pipe laying unless trench is protected.**
3. Begin excavation work at the lower end of flow line and proceed to higher flow line. Avoid over-excavating; return over-excavated bed to grade and thoroughly compact. Remove large rocks, foreign or organic material; return bed to grade and thoroughly compact.
4. Lay all pipe on required bedding to a true line slope as indicated in the drawings. Hand excavate at joints to ensure that full length of pipe lays on a solid bed. Install tongue end of pipes facing direction of drainage flow.
5. Bedding and backfilling of pipe:

    a. Bed and backfill all piping in accordance with the details indicated on the drawings. Where local or other applicable codes require more stringent specifications, those codes shall govern.

b. All piping located in County Flood Control District right of way shall be bedded and backfilled with cement stabilized sand in accordance with Flood control District requirements.

c. Cement stabilized sand shall be a homogeneous mixture of 1-1/2 sacks Portland Cement per cu. yd. of mixed material. Provide greater cement content where required by City or County Requirements.

END OF SECTION

SECTION 02795 - PERMEABLE INTERLOCKING CONCRETE PAVERS

PART 1 GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. Section Includes
1. Permeable interlocking concrete pavers.
2. Crushed stone bedding material.
3. Open-graded subbase aggregate.
4. Open-graded base aggregate.
5. Bedding and joint/opening filler materials.
6. Edge restraints.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. C 67, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
2. C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
3. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate.
4. C 140, Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8 – Freezing and Thawing.
5. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. C 936, Standard Specification for Solid Interlocking Concrete Pavers.
7. C 979, Specification for Pigments for Integrally Colored Concrete.
8. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) drop.
9. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop.
10. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
11. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

B. Interlocking Concrete Pavement Institute (ICPI)
1. Permeable Interlocking Concrete Pavement manual.

1.03 SUBMITTALS

A. In accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
B. Manufacturer's drawing and details: Indicate perimeter conditions, junction with other materials, expansion and control joints, paver [layout,] [patterns,] [color arrangement,] installation [and setting] details. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.
C. Minimum 3 lb (2 kg) samples of subbase, base and bedding materials.
D. Sieve analysis of aggregates for base and bedding materials per ASTM C 136.
E. Soils report indicating density test reports, classification, and infiltration rate measured on-site under compacted conditions, and suitability for the intended project.
F. Erosion and sediment control plan.
G. [Stormwater management (quality and quantity) calculations].
H. Permeable concrete pavers:
    1. Manufacturer's product catalog sheets with specifications.
    2. [Four] representative full-size samples of each paver type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation.
    3. Accepted samples become the standard of acceptance for the work of this Section.
    4. Laboratory test reports certifying compliance of the concrete pavers with ASTM C 936.
    5. Manufacturer's material safety data sheets for the safe handling of the specified materials and products.
    6. Manufacturer's written quality control procedures including representative samples of production record keeping that ensure conformance of paving products to the project specifications.
I. Paver Installation Subcontractor:
    1. The Subcontractor shall have suitably experienced personnel and a management capability sufficient to execute the work shown on the contract drawings and specified herein.
    2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
    3. Contractor shall conform to all local and state licensing and bonding requirements.

1.04 QUALITY ASSURANCE

A. Paver Installation Subcontractor Qualifications:
    1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.

B. Mock-Ups:
    1. Install a 10 ft x 10 ft paver area.
    2. Use this area to determine surcharge of the bedding sand layer, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
    3. This area will be used as the standard by which the work will be judged.
    4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
    5. If mock-up is not retained, remove and properly dispose of mock-up.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirement Section.
B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged container packaging with identification tags intact.
    1. Coordinate delivery and paving schedule to minimize interference with normal use of

buildings adjacent to paving.

2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift.
3. Unload pavers at job site in such a manner that no damage occurs to the product or existing construction

D. Storage and Protection: Store materials in protected area such that they are kept free from mud, dirt, and other foreign materials.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install sand or pavers during heavy rain or snowfall.
B. Do not install sand or pavers over frozen base materials.
C. Do not install frozen bedding materials.

1.07 MAINTENANCE

A. Extra materials: Provide 5% additional material for use by owner for maintenance and repair.
B. Pavers shall be from the same production run as installed materials.

PART 2 PRODUCTS

2.01 PERMEABLE INTERLOCKING CONCRETE PAVERS

A. Manufacturer (ICPI Member): Willow Creek Concrete Products, Inc.
12626 County Road 150
Kimball, MN 55353
Phone (888) 398-9631 Fax (320) 398-5416
WillowCreekPavingStones.com

B. Permeable Interlocking Concrete Paver Units:

1. Paver Type: Brickstone Permeable Concrete Paver (to match existing).

Product Name	Dimensions	Thickness	Colors Available
Brickstone Permeable Paver (match existing)	3.95 in x 7.90 in (match existing)	3.125 in. (match existing)	To be determined

A. Material Standard: Comply with material standards set forth in ASTM C 936.
B. Color: As selected from manufacturer's standard selection (to match existing).
C. Color Pigment Material Standard: Comply with ASTM C 979.
D. Size: 3.95 inches x 7.90 inches x 3.125 inches thick (Match existing).
E. Average Compressive Strength (ASTM C 140): 8000 psi (55 MPa) with no individual unit under 7200 psi (50 MPa).
F. Average Water Absorption (ASTM C 140): 5% with no unit greater than 7%.
G. Freeze/Thaw Resistance (ASTM C 67): Resistant to 50 freeze/thaw cycles with no greater than 1% loss of material. Freeze-thaw testing requirements shall be waived for applications not exposed to freezing conditions.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: As per Section 01600.

2.03 CRUSHED STONE FILLER, BEDDING, BASE AND SUBBASE

A. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131, minimum CBR of 80% per ASTM D 1883.
B. Do not use rounded river gravel for base or bedding materials.
C. All stone materials shall be washed with less than 1% passing the No. 200 sieve.
D. Joint/opening filler, bedding, base and subbase: conforming to ASTM D 448 gradation as shown in Tables 1, 2 and 3 below:

Table 1
Grading Requirements for ASTM No. 8 Bedding and Joint/Opening Filler

Sieve Size	Percent Passing
½" (12.5 mm)	100
⅜" (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.16 mm)	0 to 5

Table 2
Grading Requirements for ASTM No. 57 Base

Sieve Size	Percent Passing
1½ in. (37.5 mm)	100
1 in. (25 mm)	95 to 100
½ in. (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

Table 3
Grading Requirement for ASTM No. 2 Subbase

Sieve Size	Percent Passing
3 in. (75 mm)	100
2½ in. (63 mm)	90 to 100
2 in. (50 mm)	35 to 70
1½ in. (37.5 mm)	0 to 15
¾ in. (19 mm)	0 to 5

E. Gradation criteria for the bedding and base:

1. D_{15} base stone /D_{50} bedding stone < 5.
2. D_{50} base stone /D_{50} bedding stone > 2.

2.04 ACCESSORIES

A. Provide accessory materials as follows:

1. Edge Restraints

A. Material: Concrete.
B. Material Standard: Exceed ICPI minimum standard.

2. Geotextile Fabric:
A. Material Type and Description: Willow Creek Paving Stones Underlayment Fabric
B. Material Standard: Exceeds ICPI minimum standard
C. Supplier: Willow Creek Concrete Products

PART 3 EXECUTION

3.01 EXAMINATION

A. Acceptance of Site Verification of Conditions:

1. General Contractor shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.

    A. Verify that sub-grade preparation, compacted density and elevations conform to specified requirements.
    B. Provide written density test results for soil sub-grade to the Owner, General Contractor and paver installation subcontractor.
    C. Verify location, type, and elevations of edge restraints, [concrete collars around] utility structures, and drainage pipes and inlets.

2. Do not proceed with installation of bedding and interlocking concrete pavers until sub-grade soil conditions are corrected by the General Contractor or designated subcontractor.

3.02 PREPARATION

A. Verify that the soil sub-grade is free from standing water.
B. Stockpile joint/opening filler, base and subbase materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
C. Edge Restraint Preparation:
    1. Install edge restraints per the drawings.

3.03 INSTALLATION

A. General
1. Any excess thickness of soil applied over the excavated soil sub-grade to trap sediment from adjacent construction activities shall be removed before application of the geotextile and sub base materials.
2. Keep area where pavement is to be constructed free from sediment during entire job. Base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.
3. Do not damage drainpipes, overflow pipes, observation wells, or any inlets and other drainage appurtenances during installation. Report any damage immediately to the project engineer.

B. Geotextiles
1. Place on bottom and sides of soil sub-grade. Secure in place to prevent wrinkling from vehicle tires and tracks.
2. Overlap a minimum of 0.6 m (24 in.) in the direction of drainage.

C. Open-graded subbase and base
1. Moisten, spread and compact the No. 2 subbase in 100 to 150 mm (4 to 6 in.) lifts without wrinkling or folding the geotextile. Place subbase to protect geotextile from wrinkling under equipment tires and tracks.
2. For each lift, make at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 t (10 T) vibratory roller until there is no visible movement of the No. 2 stone. Do not crush aggregate with the roller.

3. The surface tolerance of the compacted No. 2 subbase shall be ±20 mm (± ¾ in.) over a 3 mm (10 ft.) straightedge.
4. Moisten, spread and compact No. 57 base in 100 mm to 150 mm (4 to 6 in.) lifts over the compacted No. 2 subbase with a minimum 10 t (10 T) vibratory roller until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller.
5. The surface tolerance the compacted No. 57 base should not deviate more than. ±13 mm (± ½ in.) over a 3 m (10 ft.) straightedge.

D. Bedding layer

1. Moisten, spread and compact the No. 8 bedding material.
2. Fill voids left by removed screed rails with No. 8 stone.
3. The surface tolerance of the screeded No. 8 bedding layer should not deviate more than ±13 mm (± ½ in.) over a 3 m (10 ft.) straightedge.
4. Do not subject screeded bedding material to any pedestrian or vehicular traffic before paving unit installation begins.

E. Permeable interlocking concrete pavers and joint/opening fill material

1. Lay the pavers in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to tire traffic shall be no smaller than ⅓ of a whole unit.
2. Cut pavers to be placed along the edges with a masonry saw.
3. Compact and seat the pavers into the bedding material using a low-amplitude, 75-90 Hz plate compactor capable of at least 22 KN (5,000 lbs.) centrifugal compaction force. This will require at least two passes with the plate compactor.
4. Do not compact within 2 m (6 ft) of the unrestrained edges of the paving units.
5. Fill the openings and joints with No. 8 stone.
6. Remove excess aggregate by sweeping pavers clean.
7. Compact the pavers again, vibrating the aggregate into the openings. Apply additional aggregate to the openings and joints, filling them completely. Remove excess aggregate by sweeping and compact the pavers. This will require at least two passes with the plate compactor.
8. All pavers within 2 m (6 ft) of the laying face must be left fully compacted at the completion of each day. The final surface tolerance of compacted pavers shall not deviate more than ±10 mm (± ⅜ in.) under a 3 m (10 ft) long straightedge.
9. The surface elevation of pavers shall be 3 to 6 mm (⅛ to ¼ in.) above adjacent drainage inlets, concrete collars or channels.

3.04 FIELD QUALITY CONTROL

A. After sweeping the surface clean, check final elevations for conformance to the drawings. Lippage: No greater than 3 mm (⅛ in.) difference in height between adjacent pavers.

B. The surface elevation of pavers shall be 3 to 6 mm (⅛ to ¼ in.) above adjacent drainage inlets, concrete collars or channels.

3.05 PROTECTION

A. After work in this section is complete, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. All concrete work, including sidewalks, exterior ramps, steps, miscellaneous concrete.

B. All form work.

C. Reinforcing steel.

D. Installation of sleeves which are furnished by plumbing, heating and electrical contractors.

E. Equipment bases are shown on architectural, mechanical, plumbing and electrical drawings.

F. Provide and install waterstop material at below grade joints.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Testing Laboratory services.

B. Excavation and fill.

C. Concrete paving, curbs, sidewalks and site concrete.

1.4 DRAWING REFERENCES: See drawings for reinforcing sizes and placement.

1.5 Submittals:

A. DESIGN MIX: Submit six (6) copies directly to the project Architect the proposed concrete mix(es). Include cement brand and type, aggregate identification, admixtures, proportions and anticipated strengths.

B. PLASTIC CHAIR SUPPORTS: Submit manufacturer's literature indicating dimensions, configurations and performance data. Submit sample for approval by the Architect. Space at a maximum of 45" centers each way. Provide closer spacing where required to prevent excessive sag, where indicated on the drawings, or to support the weight of concrete pump hose.

C. ADMIXTURES: Submit manufacturer's product data describing material and mix proportions.

D. WATERSTOPS: Submit manufacturer's product data describing material and installation procedures.

E. CURING COMPOUND: Submit Manufacturer's literature indicating composition and recommended application procedures.

F. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.6 SAMPLES

A. Plastic chair support.

1.7 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.8 QUALITY ASSURANCE

A. Cast-in-place concrete shall be installed by technicians specially trained in the proper handling, placing and protection of concrete and reinforcing steel. If required by the Architect, installer shall submit for approval a list of similar installations successfully completed.

B. Comply with ASTM C 94; ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI's "Manual of Standard Practice."

C. Engage a qualified independent testing agency to design concrete mixes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. GENERAL: All materials used in the Work shall be stored or handled in a manner that will prevent deterioration; any materials that have been damaged shall be immediately and completely removed from the Work. All manufactured materials, such as cement, shall be delivered and stored in their original packages that show marks or other evidence of damage shal be wholly rejected.

B. Deformed Reinforcing Bars: ASTM A 615/A 615M, Grade 60.

C. Plain Steel Wire: ASTM A 82, as drawn.

D. Steel Welded-Wire Fabric: ASTM A 185, flat sheets not rolls. Use mesh for sidewalks and equipment pads, as indicated on the drawings.

E. Portland Cement: ASTM C 150, Type I, latest edition.

F. The use of Fly Ash in the concrete mix is not acceptable.

G. Aggregates: ASTM C 33, uniformly graded.

H. Fiber Reinforcement: ASTM C 1116, Type III, synthetic fibers, 1/2 to 1 inch.

I. Air-Entraining Admixture: ASTM C 260.

J. Chemical Admixtures:
1. General: All admixtures shall be added only at the plant during mixing and must be prior approved by the Testing Laboratory. Admixtures shall comply with the requirements of ASTM C260 and C-494. Admixtures containing calcium chloride are not acceptable. Do not use admixtures in footings or seal slabs.

K. Water Stops: Flat dumbbell or center-bulb type, of either rubber (CRD C 513) or PVC (CRD C 572).

L. **Vapor Barrier: Reference Spec Section 07260 Under Slab Vapor Barrier.**

M. Liquid Membrane-Forming Curing Compound: ASTM C 309, clear, Type I, Class A or B, solvent borne, wax free.

N. Liquid Membrane-Forming Curing and Sealing Compound: ASTM C 1315, clear, Type I, Class A, solvent borne.

O. Slip-Resistive Aggregate: Factory-produced, rustproof, nonglazing, fused aluminum-oxide granules or crushed emery, unaffected by freezing, moisture, and cleaning materials.

P. Joint-Filler Strips: ASTM D 1751, cellulosic fiber, or ASTM D 1752, cork.

Q. Repair Underlayment: Factory-packaged, portland or blended hydraulic cement-based, polymer-modified, self-leveling underlayment with minimum 28-day compressive strength of 4100 psi (29 MPa).

R. Repair Topping: Factory-packaged, portland or blended hydraulic cement-based, polymer-modified, self-leveling traffic-bearing topping with minimum 28-day compressive strength of 5700 psi (39 MPa).

2.2 MIXES

A. Proportion normal-weight concrete mixes to provide the following properties:

1. Compressive Strength:
   a. Ramps and sidewalks: 3000 psi at 28 days.
2. Slump Limit: 5 inches at point of placement.
3. Air Content: 5.5 to 7.0 percent for concrete exposed to freezing and thawing, 2 to 4 percent elsewhere.

2.3 FORMWORK

A. GENERAL: Forms shall conform to the shapes, lines, grade and dimensions of the concrete as indicated in the drawings. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free of loose knots or other defects. Lumber once used in forms shall be thoroughly cleaned before another usage. Form **full depth** of outside face of perimeter grade beams without horizontal joints or

cracks. Forms shall be substantial and sufficiently tight to prevent leakage. They shall be properly shored, braced or otherwise tied or supported to maintain the desired position and shape during and after placement of concrete. Use no formwork which may stain exposed concrete surfaces.

B. FORM LINING: For exposed concrete the final finish shall be smooth, even and free of defects.

C. FORM REMOVAL: Forms shall remain in place sufficient time for the concrete to obtain necessary strength to support its own weight and construction load.

PART 3 - EXECUTION

3.1 CONCRETING

A. Construct formwork and maintain tolerances and surface irregularities within ACI 117 limits of Class A for concrete exposed to view and Class C for other concrete surfaces.

B. Set water stops where indicated to ensure joint water tightness.

C. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.

D. Accurately position, support, and secure reinforcement.

E. Install construction, isolation, and contraction joints where indicated. Install full-depth joint-filler strips at isolation joints.

F. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.

G. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.

H. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere.

I. Slab Finishes: Float finish for ramps and surfaces to receive waterproofing or other direct-applied material. Trowel and fine-broom finish for surfaces to receive thin-set tile. Nonslip-broom finish to exterior concrete platforms, steps, and ramps.

J. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over initially floated surfaces; tamp and float. Expose nonslip aggregate after curing.

K. Uniformly spread 100 lb/100 sq. ft. (49 kg/10 sq. m) of mineral dry-shake floor hardener over initially floated surfaces, repeat float finishing to embed each application, and then apply a trowel finish.

L. Cure formed surfaces by moist curing for at least seven days.

M. Begin curing concrete slabs after finishing.

N. Owner will engage a testing agency to perform field tests and to submit test reports.

O. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

P. Repair slabs not meeting surface tolerances by grinding high areas and by applying a repair underlayment to low areas receiving floor coverings and a repair topping to low areas to remain exposed.

3.2 CLEANING AND PROTECTION

A. CLEANING: Slabs are to be kept free of any foreign substances (wax, oil, paint, etc.) or surface irregularities that may affect the final appearance of the completed installation.

B. Unless otherwise approved by the Architect, no vehicular traffic will be allowed on any concrete until after the 7 day concrete tests have been made by the laboratory indicating that the concrete has attained 3,000 psi compressive strength.

C. Contractor shall coordinate with Architect and Owner to determine a suitable on-site “wash-out” area for concrete trucks. Contractor shall be responsible for clean-up of the area.

D. Contractor shall keep clean all adjacent public streets and rights of way. Wash down daily or more often as needed to remove mud and maintain a safe condition at entrances/exits to job site.

END OF SECTION

SECTION 04100 — MORTAR

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

A. Perform all work required to furnish the Masonry Mortar indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

C. Application of Mortar used in the installation of masonry units is specified in each respective Unit Masonry Section and is not included in the work required for this Section.

1.03 SUBMITTALS:

A. Submit product data on all mortar and admixtures.

B. Submit certification that mortar and grout material meet ASTM standards.

1.04 PRODUCT DELIVERY AND STORAGE:

A. Delivery: Delivery materials to Project site dry and in unbroken containers.

B. Storage: Store materials above ground in waterproof shelters.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. PORTLAND CEMENT:
   a. Capitol — Lone Star
   b. Trinity — Texas Industries

c. Universal Atlas Cement

2. LIME:
   a. Gibsonburg Lime Products Co., Tiger Limes
   b. Texas Lime Company
   c. United States Gypsum Company
   d. National Gypsum Company

3. WATER PROOFING ADMIXTURE:
   a. Master Builders-Omicron Mortarproofing
   b. Sonneborn Building Products-Hydracide
   c. W.R. Grace-Hydratite Plus

4. MORTAR COLOR:
   a. Gray-

5. DRY BLOCK-One pound per cubic foot of cementitious material, ½ sack per sack of 2 sacks of cement fluted, split –face CMU for warranty purposes

B. Refer to Section 01600 - Substitutions Procedures for manufacturers not listed above.

2.02 MATERIALS:

A.	Portland Cement:	ASTM C150, TYPE I.
B.	Hydrated Lime:	ASTM C207, TYPE S.
C.	Fine Aggregate:	ASTM C144,
D.	Coarse Aggregate:	ASTM C404, Size No. 8
E.	Water:	Clean and free of deleterious acids, alkalies, or organic matter.
F.	Waterproofing Admixture:	Omicron Mortarproofing, manufactured by Master Builders.
G.	Grout Admixture:	“Fluidifier” by Master Builders.
H.	Sealer:	“DEFY” Block Water Repellant

2.03 PROPORTIONS AND MIXING:

A. Meet requirements of ASTM C270 and proportion mortar types as specified.

B. Meet requirements of ASTM C476 for masonry grout and proportion grout type as specified.

C. Proportion material accurately and mix thoroughly by machine to a uniform consistency and color. Mix mortars with the maximum amount of water consistent with workability.

D. Do not use mortar that has begun to set. Retemper mortar by adding water if mortar begins to stiffen from evaporation or absorption of a part of the mixing water. Use and place mortar in final position within 2-1/2 hours after mixing.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. See specific section of Masonry Materials for installation instructions.

3.02 MORTAR SCHEDULE:

A. Exterior Masonry Walls:
   1. Mortar-Type S, ASTM C270.
   2. Waterproofing Admixture-***dry block required to provide warranty.***

B. Interior Masonry Partitions:
   1. Mortar-Type N, ASTM C270.

C. Interior Paving Tile:
   1. Mortar-Type S, ASTM C270.

D. Exterior Paving Tile:
   1. Mortar-Type M, ASTM C270.

3.03 GROUT SCHEDULE:

A. Paving Tile:
   1. Portland Cement-one part.
   2. Fine Aggregate-three parts.
   3. No lime.
   4. Sealer

END OF SECTION

SECTION 04220 — CONCRETE MASONRY UNIT

PART 1 - GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 SCOPE:

A. Perform all Work required to complete the Concrete Unit Masonry indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

1.03 PRODUCTS INSTALLED UNDER THIS SECTION BUT SPECIFIED ELSEWHERE:

A. Section 04100 – Mortar.

B. Section 07920 – Sealants and Caulking.

1.04 SUBMITTALS:

A. Submit technical data for each type wall reinforcement, anchors and ties.

B. Submit 12” long sample of control joint filler.

C. Submit certificate that masonry units conform to ASTM and NBFU standards specified.

1.05 STORAGE AND HANDLING:

A. Handle materials in a manner to prevent breakage and chipping. Store materials on platforms raised free of ground and protect materials with stainproof tarpaulin covers.

1.06 ENVIRONMENTAL CONDITIONS:

A. Lay no masonry when the temperature of the air is 40°F. twenty-four (24) hours after laying. Do not build on frozen work.

B. Store masonry units on the job so that they are kept off the ground and protected from rain.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Material manufactured by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. REINFORCEMENT, ANCHORS AND TIES:

Duro-O-Wal	AA Wire Products Company
Heckman Build Products, Inc.	Hohmann and Barnard, Inc.
Masonry Reinforcing Corp. of America	National Wire Products Corp.

2. SPLIT FACE BLOCK SEALER:
"DEFY" Split Face Block Water Repellant

2.02 MATERIALS:

A. UNITS:
1. Hollow Concrete Masonry: ASTM C90, medium weight, Grade N-1
2. Screen CMU at mechanical yard (match existing).

B. REINFORCEMENT:
1. Block Wall Joint Reinforcement:
ASTM A82, AA Wire Products Co., "BLOK-TRUS", AA600 two wire, width 2" less than wall thickness, standard weight galvanized ASTM A116, Class 1.
2. Lintel and Bond Beam Reinforcement: Domestic, ASTM A615, or ASTM A616, deformations ASTM A305. Unless otherwise shown on drawings provide 2-#4 Ø cont. lap 30 dias.

C. WATER: Clean and free of deleterious acids, alkalies or organic material.

D. <u>Bullnose edge at all masonry corners for interior walls and at cell areas.</u>

PART 3 - EXECUTION

3.01 CONDITION OF SURFACES:

A. Do not commence with masonry work until foundation has properly cured a minimum of seven (7) days and reinforcing steel that is dowelled for masonry units has been approved.

B. Consult other trades and make provisions to permit installation of their work to avoid cutting and patching. Before closing up any pipe chase, or similar inaccessible spaces, remove all rubbish and sweep out areas to be enclosed.

3.02 PREPARATION:

A. Provide, install and maintain all scaffolding, staging and forms of protection necessary for execution of the work; substantially constructed, maintained, moved and dismantled as required to properly follow the sequence of operation.

B. Provide and install all shores and centering for the work, constructed true to require shape, size and form; well-braced and made rigid in all parts, and capable of supporting and sustaining the loads to which subjected.

C. Leave all shores and centering in place until the masonry has sufficiently set to safely carry its own weight and the added loads of construction. Shore free-standing walls to prevent windstorm damage until walls are protected.

D. Examine surfaces to receive masonry and report any discrepancies before commencing work. Accept no former measurements, but lay work according to the plans and dimensions thereon.

3.03 LAYING CONCRETE MASONRY UNITS:

A. Do not dampen units before laying, and do not lay units which have surface water or contain frost. Lay units plumb, level, and true to a line in running bond, or as indicated. Align on exposed face or as indicated.

B. Lay first course of masonry in full bed of mortar. Lay all other hollow units in a full mortar bed on shell surface and at ends.

C. Lay hollow units with the thicker edge of the face shell up and make all joints 3/8” thick. Lay corners prior to laying mid-portion of wall. Rock closures into place with the head joints shoved against the two adjacent units in place.

D. Cut units with power saw through the unit to insure straight, evenly cut edges. Do not use fractional parts of masonry units in the work where whole units can be used.

E. Avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after setting in place. Remove mortar and replace with fresh mortar where adjustment must be made after initial settings.

F. Do not use masonry units having cracks, chipped edges, broken corners or other defects in exposed faces. Build walls full thickness as shown. Blocks with open cells exposed will not be permitted.

G. Provide all special precast lintels, fillers, closers, control joint units, trough tile, etc., required to form all corners, returns, openings, jambs, offsets, etc., to maintain a proper bond throughout all masonry work.

H. Protect all sills, ledges, off-sets, etc., from droppings of mortar and protect door jambs and corners from damage during construction.

I. Stop off longitudinal run of masonry only where absolutely necessary by racking one-half block length in each course. Remove loose mortar before new work is started.

J. Cover tops of walls at end of day’s work and when rain is imminent, with waterproof membrane. Overhang two feet on each side of wall and anchor securely. Protect masonry from weather or construction damage.

3.04 JOINTS:

A. Mortar joints shall be straight, clean and uniform in thickness. Tool joints of all walls to produce a dense surface well bonded to the edges. Joints which are not tight at the time of tooling shall be raked out, pointed, and then tooled.

B. Tool when the mortar is partially set but still sufficiently plastic to bond. Use a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.

C. Finish joints that will remain exposed with a tool slightly larger than the width of the joint to form a concave surface. Tool vertical joint first. Finish flush, joint that will not remain exposed.

D. Unless otherwise specified the horizontal and vertical mortar joints shall be 3/8" thick with full mortar coverage on the face shells and on the webs surrounding cells to be filled with grout.

E. Vertical head joints shall be buttered well for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds with both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.

3.05 REINFORCING:

A. Install continuous joint reinforcing 16" on centers for running bond. Install joint reinforcing in the first and second bed joint above and below openings extending 24" beyond each side of opening.

B. Lap splices a minimum of 6" and install prefabricated corners and tees at such locations. Do not extend reinforcing through expansion joints. Center reinforcing in joint with 5/8" minimum mortar coverage on the exterior face and ½" minimum mortar coverage on the interior face.

C. Do not extend reinforcing through control joints when anchorage is provided on each side of joint. If no anchorage is provided at joint, extend reinforcing through control joint at 48" on center.

D. Reinforce bond beams and lintels as indicated with continuous bars placed as the work progresses. Maintain ½" minimum clear distance between masonry units and reinforcement.

3.06 ANCHORING:

A. Anchor interior partitions to abutting or intersecting walls by common bond or with prefabricated reinforcing tees.

B. Anchor interior load bearing partitions laterally a maximum of 12'-0" o.c. by either an intersecting partition or anchorage to foundation with 4-#4Ø dowels and continuous 4 #4Ø bars to top of wall. Grout fill cells to top of wall.

C. Do not attach construction supports to wall except where specifically permitted by the Architect.

D. Intersecting load bearing masonry walls and partitions shall be bonded by the use of rigid steel anchors at twenty-four (24) inches o.c. maximum. Corners shall have a standard masonry bond by overlapping units and shall be solid grouted.

3.07 CONTROL JOINTS:

A. Locate 3/8" wide control joints as indicated but do not exceed 30 feet on centers. Keep vertical joints straight, true and continuous from top to bottom of masonry.

B. Use sash units to form control joints and install continuous control joint filler with sash units tightly butted to compress neoprene flanges and completely seal joint. Where masonry abuts structural concrete or steel and control joint filler cannot be used, keep joint clean of mortar as work progresses or use expansion joint spacer.

C. Locate building expansion joints as indicated and install expansion joint spacer properly recessed back from face to allow for sealant.

3.08 EMBEDDED ITEMS:

A. Build in flashing, sleeves, anchors, clips, mechanical and electrical items, and accessories as work progresses. Accurately cut units to fit all plumbing, ducts, openings and electrical work with all holes neatly patched.

B. Install loose lintels, as indicated in full beds of mortar. Fill voids at metal frames with mortar and build in frame anchors.

3.09 GROUTING:

A. Fill with grout, vertical cells, bond beams, lintels and other structural members having reinforcement. Secure in place and inspect reinforcing before grouting. Keep mortar droppings out of grout space and puddle or vibrate all grout in place.

B. Provide solid bearing under structural members at least 8" vertically and at least 16" horizontally. Bearing shall be hollow units reinforced with 2#4Ø bars U.N.O. and filled with concrete grout.

C. Build masonry in filled cell construction to preserve the unobstructed vertical continuity of the cells to be filled. Fully bed all walls and cross webs forming such cells to prevent leakage of grout and strike cell joints smooth. Maintain a continuous vertical alignment of cells so the unobstructed cell area is not less than 2"x3".

D. Grout vertical cells in lifts not to exceed 4'-0". Stop grout where necessary at mid-point but not over openings, when filling trough unit and provide suitable dam to retain grout. Stop grout one and one half inches below the top of the last course when filling vertical cells to form key for next pour.

E. Grout from inside face of masonry and prevent grout from staining masonry face. Protect projecting surfaces from droppings and clean immediately any grout which comes in contact with face of masonry.

3.010 CLEANING:

A. Keep face of blockwork free from excess mortar while laying blocks. Clean blockwork that will remain exposed, promptly, with fiber brushes and clear water. Use of wire brushes or acid permitted only with specific approval.

B. Repair and repoint defective work and pin line holes to match adjacent similar work. Replace broken or damaged blocks.

END OF SECTION

SECTION 05120 — STRUCTURAL STEEL

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Furnish and erect all structural steel.

B. All cutting and fitting, welding and bolting of structural steel members.

C. Loose linters and linters supported from structural members.

D. Shop coat of paint on structural steel members and field touch-up.

E. Temporary bracing of structural steel during erection.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Steel joists.

B. Miscellaneous metals.

1.4 SUBMITTALS

A. Six (6) blueline prints of each sheet of shop drawings required. Contractor shall submit shop drawings directly to the project Architect.
   1. Indicate size, material, and strength of members.
   2. Show locations and installation procedures.
   3. Include details of shear heads, collar channels, camber, shop coats, joints, attachments, and clearances.
   4. Prepare setting Drawings, templates, and procedures indicating locations of structural bolts, and fastening holes for other Work.

B. Submit mill certificates direct to Structural Engineer with shop drawings.

C. Submit welder's qualification records.

D. Miscellaneous metals shall be issued as a separate submittal directly to the Architect and not as part of the structural steel submittal.

E. Where required submit proof of city approval for fabricator and erector.

F. Submit written certification of domestic origin for bolts.

G. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in metals and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the Project.

1.6 QUALITY ASSURANCE

A. Fabrication and erection of structural steel shall meet or exceed the minimum current requirements of the following standards except where more stringent requirements are indicated in the drawings or specifications:
   1. AISC "Code of Standard practice for Steel Buildings and Bridges".
   2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the "Commentary of the AISC Specification", Eighth Edition.
   3. AWS Dl.1, "Structural Welding Code Dl.l".
   4. ASTM A-6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".
   5. ASTM A-36, Specification for Structural Steel.
   6. ASTM A-123, Specification for Zinc (Hot-Dip Galvanized Coatings on Iron and Steel Products.
   7. ASTM A-307, Specification for Carbon Steel Externally Threaded Standard Fasteners.
   8. ASTM A-325, Specification for High-Strength Bolts for Structural Steel Joints.
   9. ASTM A-436, Specification for Hardened Steel Washers.
   10. ASTM A-500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   11. ASTM A-563, Specification for Carbon and Alloy Steel Nuts.

B. Fabricators shall be currently approved by the local code authority for erection of steel structures. Contractor shall submit evidence of city approval with the list of proposed subcontractors for the project.

C. Each welder performing work on this Project shall be qualified in accordance with American Welding Society Structural Welding Code, AWS Dl.1 within 12 months of the commencement of welding on this Project. Welders shall be certified for the position of weld which they are performing. Welding shall be tested as specified under Testing Laboratory Control below.

PART 2 - PRODUCTS

2.1 MATERIALS

A. GENERAL:
   1. All materials shall be new, clean and straight within allowable tolerances. Members damaged, warped or stressed prior to or after erection shall be replaced with new material.
   2. All structural steel shall conform to the Standard Specifications of the ASTM for Steel for Bridges and Buildings, A-36 (or ASTM A-500, grade B for square or rectangular tube shapes), unless otherwise indicated on the drawings.
   3. Purlins shall be precision roll-formed of 14 ga. or 16 ga. steel wity a minimum yield of 55,000 psi. Size and spacing of purlins shall be as indicated on the drawings.

B. WELDING ELECTRODES: #E60 Series Submerged Arc Grade SA-1, #E70 Series Submerged Arc Grade SA-2.

C. BOLTS: Comply@ASTMA-307for standard bolts and ASTMA-325 for high-strength bolts, sizes as indicated in the drawings and structural notes. Furnish certification that bolts are domestic origin.

D. ANCHOR BOLTS:
1. Furnish to the General Contractor all anchor bolts, setting templates and drawings required for complete and accurate installation.
2. Coordinate delivery of anchor bolts for installation by other trades.

E. GROUT: Premixed, non-shrink, non-metallic type providing a minimum compressive strength of 7,000 psi at 28 days and a maximum initial set time of one hour at 73 degrees F. "Masterflow 713" as manufactured by Master Builders or equivalent by Cormix Construction Chemicals or Sauereisen Cements Co.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate the various parts of the steel frame from the materials specified using welded shop connections and bolted field connections. Shop drawings shall be prepared accordingly.

B. Splicing of members is prohibited without prior approval of the project structural engineer. A member having splice not spec7ifically approved on the shop drawings will be rejected. Spliced members will not be permitted where steel is exposed in finished areas.

C. Provide holes @ maximum 36" o.c. for 3/8" diameter bolts in all steel where wood nailers occur, unless closer spacing is indicated in the drawings or notations.

D. All workmanship shall be in accordance with the requirements of the AISC. The workmanship in exposed rigid frames shall be in accordance with the AISC requirements for Architecturally Exposed Structural Steel.

3.2 GALVANIZING

A. Hot dip galvanize all steel sections which are fully or partially exposed to weather or indicated in the drawings to be galvanized.
B. All galvanizing shall be done after fabrication of members.
C. Comply with requirements of ASTM A-384 to protect against warping.
D. Do not apply silicone protective coating to galvanized steel.

3.3 SHOP PAINTING

A. Structural steel shall be given one shop coat of the specified paint. Do not shop coat the following members when scheduled to receive sprayed fireproofing:
1. Beam with flange width exceeding 12 inches.
2. Column with flange width exceeding 16 inches.
3. Beam or column with web depth exceeding 16 inches.

B. Verify with the fireproofing manufacturer the compatibility of the specific proposed primer with the fireproofing material.

C. All surfaces shall be clean, dry and free from mill scale or rust.

D. Fabricator shall exercise special care in painting those portions of structural steel which *will* be exposed to view when the building is complete. Sags, run, crawls, and other defects will not be permitted.

3.4 DELIVERY AND HANDLING

A. Contractor shall inspect all material when delivered and store on platforms or racks to keep material off the ground. Keep structural steel clean of dirt and other foreign matter.

B. Clean all contact and bearing surfaces thoroughly before erection.

3.5 ERECTION

A. The structure shall be erected, plumbed and leveled to the lines and grades indicated on the drawings before final connections are made. Base plates shall be grouted using specified nonshrink grout in accordance with manufacturer's printed directions.

B. If exposed to View, erection angles, seats, tags shall be removed, etc., plugged, welded and ground smooth.

C. All welding shall be performed by experienced mechanics and in accordance with the requirements of the American Welding Society Code (A.W.S.).

D. For cantilever beams, allowance shall be made for deflection when final loads are applied.

E. No field cuts or holes shall be flame cut. Necessary field holes shall be punched or drilled and slotted. All field steel modifications shall be inspected and approved by the project structural engineer and cost of such modifications shall be the responsibility of the Contractor.

F. No structural members shall be erected which have been bent or deformed in transit to the site or by storage and handling on the site.

G. Installed work shall comply with AISC allowable tolerances.

3.6 TEMPORARY BRACING

A. Structural steel shall be temporarily braced as required to resist all wind loads and construction loading for which the structure has been designed.

B. Structural steel shall be braced as the structure is erected and structure shall not be left overnight without adequate bracing.

3.7 WELDING

A. All welds and the adjacent spattered areas shall be cleaned by sandblasting, wire brushing, chipping or other non-damaging means for removal of excess weld metal. Exposed welds shall be ground smooth. Welds in galvanized material shall be touched up after cleaning with "ZRC" cold galvanizing.

B. Meet requirements of American Welding Society, "Code for Arc and Gas Welding in Building Construction".

C. Meet requirements of American Welding Society, "Qualifications of Welding Procedures and Operators".

D. Meet requirements of American Safety of Testing Materials, "Specifications for Iron and Steel Arc Welding Electrodes", A233-43T.

3.8 TESTING LABORATORY CONTROL

A. GENERAL:
1. Three copies of mill certificates attesting to the physical and chemical characteristics of the steel shall be transmitted to the Owner's independent testing laboratory upon request. In the event that mill certificates are not submitted, the Owner's testing laboratory shall perform physical and chemical tests in accordance with ASTM requirements, all at the Contractor's expense.

2. Contractor shall submit to the Owner's testing laboratory the certificates from an independent testing laboratory attesting to each welders' qualifications in accordance with A.W.S. requirements.
3. Where structural steel is fabricated outside of the greater Houston area, fabricator shall pay the travel and daily subsistence expense of the Owner's laboratory technician.

4. The Owner’s independent testing laboratory shall be the sole judge as to whether materials and erection of structural steel meets the requirements of these specifications. Materials and installation not meeting specified requirements shall be removed and replaced at the Contractor's expense.

B. TESTING OF WELDS:
1. Shop Welds:
   (a) An independent testing laboratory retained by the steel fabricator shall perform a visual inspection of a minimum of 10% of all structural steel shop welds. Any additional testing required by the Contractor shall be paid for by the Contractor. Any additional testing required by the fabricator shall be paid for by the fabricator.
   (b) Where the structural drawings indicate shop welded connections to be tested, 100%of such welds shall be tested by the fabricators independent testing laboratory using ultrasonic or radiographic methods.
   (c) Structural steel shall not be shipped until the laboratory testing reports have been reviewed by the structural engineer.
   (d) Inspection of shop welding of bar joists is at the fabricator's option.

2. Field Welds:
   (a) All field welds to be tested shall be tested by the Owner's independent testing laboratory using ultrasonic or radiographic methods. Such testing shall be paid from the Testing Allowance.
   (b) Test I 00% of all field welds of the types indicated on the structural drawings to be tested.
   (c) 1 00% of the following types of field welds shall be tested whether or not indicated on the drawings to be tested: full moment connections in rigid frames, welded beam splices, and welded column splices.
   (d) 15%-20% of all other types of structural steel field welds shall be visually inspected by the Owner’s testing laboratory. Any additional testing required by the Contractor shall be paid for by the Contractor.
   (e) All field welds which are indicated on the Structural Drawings to be tested shall be identified with the welder's initials in chalk or wax crayon.

3. Retesting:
   (a) All welds rejected after testing shall be repaired and retested at the Contractors expense, whether shop welds or field welds. Shop weld retesting shall be performed by the fabricators independent testing laboratory and field weld retesting shall be performed by the Owner's independent testing laboratory.
   (b) If more than 10% of the required numbers of tested shop welds fail testing, an additional 20% of the welds shall be tested. If more than 1 0% of these welds fail, another 20% of

the welds shall be tested. This procedure shall continue until either all welds are tested, or less than 10% of the welds fail in the last 20% tested.

3.9 FIELD TOUCHUP

A. After erection, all structural steel shall be cleaned of rust and touched up with the specified shop coat paint.

B. Steel shall be touched up wherever the shop coat has been damaged by handling, or during erection or by welding.

C. All erection nuts and bolts shall be wire brushed and painted.

D. Upon completion of this erection, any exposed structural steel shall be made ready for finish painting.

END OF SECTION

SECTION 05210 — STEEL JOISTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Furnish and erect open web high strength steel joists, K-series, and long span joists produced of either cold formed or hot rolled sections as indicated in the drawings and as specified herein.

B. Provide ceiling extensions where required, top and/or bottom chord extensions as detailed, top and bottom chord reinforcing as detailed, and all spacers, bridging, anchors, etc. required for complete installation.

C. Provide shop primer coat on all steel joists and field touchup.

D. Erection of all steel joists, all welding, boiling, cleaning and priming of welded areas, and all materials incidental to erection, including welding electrodes, temporary bracing, guy wires, bolts, washers, etc. as required for a complete installation.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Steel floor and roof deck, cementitious wood fiber deck.
B. Structural steel.
C. Miscellaneous metals.

1.4 SUBMITTALS

A. One (1) each reproducible sepia and four (4) blueline prints which include steel grades, weld size and grades for all steel joists. Contractor shall submit shop drawings directly to the project structural engineer.

B. Submit mill certificates direct to Structural Engineer with shop drawings.
   1. Indicate size, material and strength of members.
   2. Show locations and installation procedures.
   3. Prepare templates and indicate locations of fastening holes for other work.

C. Reference Section O1340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the Project.

1.6 QUALITY ASSURANCE

A. Design, fabrication and erection of steel joists shall meet or exceed the minimum standards of the Steel Joist Institute except where more stringent requirements are indicated in the drawings or specifications:

B. Each welder performing work at the site shall be qualified in accordance with America Welding Society Structural Welding Code, AWSD1.1 within 12months of the commencement of welding on this Project.

C. Fabricators shall be currently approved by the local code authority for fabrication and erection of steel structures.

PART TWO - PRODUCTS

2.1 MATERIALS

A. The steel used in the manufacturer of chord and web sections shall conform to ASTM Specifications for Structural Steel, A-36, modified to eliminate the upper limit of tensile strength.
B. Steel for spacers, bridging, bearing plates, anchors, etc., shall conform to ASTM A-7.
C. Shop coat paint shall be primer meeting requirements of Federal Specification TT-P-636C.
D. Members damaged, warped or stressed prior to or after erection shall be replaced with new material.
E. Joist manufacturer shall review all U.L. designs as indicated in the drawings or specifications and comply wity all size and weight requirements stipulated. Reference Architectural drawings and Structural drawings for U.L. design indications.

PART THREE - EXECUTION

3.1 FABRICATION

A. Steel joists shall be fabricated in accordance with Standards of the Steel Joist Institute.
B. Punching of chord members shall not be permitted.
C. Steel joists shall be symmetrical about the Y-Y axis.
D. Splicing of members may occur at any point in chord or web members, and shall be designed in accordance with Standards of the Steel Joist Institute. Spliced members will not be permitted where joists are exposed in finished areas.

3.2 SHOP PAINTING

A. All joists shall receive one shop coat of primer except where scheduled to receive sprayed fireproofing.

B. All surfaces shall be clean, dry and free from mill scale or rust.

C. During and after erection clean and touch-up scratches and welds with specified primer.

3.3 DELIVERY AND HANDLING

A. Contractor shall inspect all material when delivered and store on platforms or racks to keep all material off the ground. Clean all dirt, rust and other foreign matter from joists before erection.

3.4 ERECTION

A. Joists shall be set level and plumb or sloped as indicated on the drawings. Joists shall be welded to their steel supporting members and bridging shall be welded in place as soon as joists are set. Construction loads shall not be applied to the joists until they are permanently secured at bearing points and the bridging installed. Extend joist ends a minimum of 2-1/2" over steel supports.

B. Erect steel joists in accordance with AISC S326. Hoist by top chord only between third and quarter points.

C. No joist shall be erected which has been bent or deformed from its original shape. Replace with new members.

D. Install horizontal or diagonal bridging as indicated in the drawings and in accordance with SJI, AISC.

E. No field cuts or holes shall be flame cut. Necessary field holes shall be drilled. All proposed field modifications must be approved by the Project Structural Engineer.

3.5 FIELD WELDING OF JOISTS

A. All welds and the adjacent spattered areas shall be cleaned by sandblasting, wire brushing, chipping or other non-damaging means for removal of excess weld metal. Exposed welds shall be ground smooth. Welds in galvanized material shall be touched up after cleaning with "ZRC cold galvanizing".

B. Meet requirements of American Welding Society, "Code for Arc and Gas Welding in Building Construction".

C. Meet requirements of American Welding Society, "Qualifications of Welding Procedures and Operators".

D. Meet requirements of American Safety of Testing Materials, "Specifications for Iron and Steel Arc Welding Electrodes", A233-43T.

E. Shop welds shall be done in accordance with the Standards of the Steel Joist Institute.

3.6 FIELD TOUCHUP

A. After erection, all steel joists shall be cleaned of rust and touched up with the specified shop coat paint.

B. Steel shall be touched up wherever the shop coat has been damaged by handling, or during erection or by welding.

C. Coat any surfaces to be in contact with mortar, concrete, masonry or aluminum with bituminous paint.

D. Upon completion of this erection, any exposed steel joists shall be made ready for finish painting.

3.7 TESTING LABORATORY CONTROL

A. A laboratory designated by the Owner will perform testing and inspection services in the shop and in the field. Contractor shall notify Testing Laboratory a minimum of 48 hours prior to beginning fabrication of members.

B. Where defective work, or work not in accordance with these specifications is determined, the Contractor shall pay for correction of the work, re-testing and re-inspection of the work, and for X-ray testing of additional weldments.

C. Three copies of mill certificates attesting to the physical and chemical characteristics of the steel shall be transmitted to the testing laboratory upon request. In the event that mill certificates are not submitted, the Owner's testing laboratory shall perform physical and chemical tests in accordance with ASTM requirements, all at the Contractor's expense.

D. Contractor shall submit to the Owners testing laboratory for approval, certificates from an independent testing laboratory attesting to the welders qualifications in accordance with A.W.S. requirements. All welds shall be identifiable by the welder's mark.

E. Where steel joists are fabricated outside of the greater Houston area, fabricator shall pay the travel and daily subsistence expense of the laboratory's technician.

F. The Owners testing laboratory shall be the sole judge as to whether materials and erection of steel joists meets the requirements of these specifications. Materials and installation not meeting specified requirements shall be removed and replaced at the Contractors expense.

END OF SECTION

SECTION 05310 — STEEL FORM FLOOR DECK AND STRUCTURAL ROOF DECK

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide all labor, materials, equipment, and services necessary for the furnishing and installation of steel form floor and structural roof deck at above grade floors. For the purposes of this specification section, Structural Roof Deck is defined as any metal roof decking not integral with lightweight insulating concrete fill.

B. Provide additional requirements as may be indicated on the structural drawings and notations.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Light gauge metal roofing deck (less than 22 gauge) at insulating concrete fill.

B. Concrete and reinforcing.

C. Structural steel and steel joists.

D. Miscellaneous metals – supplementary framing.

1.4 SUBMITTALS

A. Submit manufacturer’s printed literature indicating material properties, loading criteria, and installation procedures.

B. Submit drawings or printed illustrations showing deck profile and configuration.

C. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 DRAWING REFERENCES

A. Reference structural drawings and notes for gauge, depth and other requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wheeling

B. Bowman

C. Merco

D. Roll Form

E. Vulcraft

2.2 MATERIALS

A. The steel floor deck and structural units shall be as manufactured by Roll Form Products, Inc., or equivalent by specified manufacturer. Type, finish, section modulus and gauge as shown on the structural drawings.

B. The Units shall be formed from steel sheets conforming to ASTM A-611 Grade C or ASTM A446 Grade A with a minimum yield strength of 33 KSI, and shall be listed by Underwriter's Laboratories.

C. Deformations shall be formed to provide a mechanical lock between concrete and steel.

D. Unless noted otherwise, floor deck shall be galvanized to conform to ASTM A-525, G60. Provide field touch-up with "ZRC" zinc-rich primer at welds and where galvanizing is damaged.

E. ACCESSORIES:
1. Weld Washers: Mild steel, uncoated, 5/8 inch outside diameter, 1/8 inch thick. Use for light gauge non-composite decks.
2. Where metal closure strips, wet concrete stops, and related accessories are required, but not indicated in the drawings, provide and install 22 gauge galvanized sheet steel of profile and size required.

PART 3 - EXECUTION

3.1 ERECTION

A. Panels shall be secured to the steel framework at ends and at intermediate supports by welds spaced 12" o.c. and not less than ¾" diameter welds. Use welding washers at light gauge non composite decks. Side laps shall be nested and button punched 3'-0" maximum on centers. The erection of composite floor units shall be performed in accordance with manufacturer's printed instructions and approved erection drawings.

B. Install sheet metal closures at ends of runs, penetrations and columns.

END OF SECTION

SECTION 05410 — LIGHT GAGE METAL FRAMING SYSTEMS AND GYPSUM SHEATHING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Furnish and install exterior metal stud framing as shown on the drawings and specified herein.

B. Furnish and install water resistant gypsum board sheathing at exterior face of exterior metal studs.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry.

B. Interior drywall systems.

C. Wall Insulation.

D. Dampproofing and Waterproofing.

E. Exterior plaster (stucco).

1.4 SUBMITTALS

A. Submit manufacturer’s product data describing all materials.

B. Submit manufacturer’s certification of structural properties, only for products to be used in the project.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in manufacturer's original packaging and stored flat in a covered, dry area providing protection from damage and exposure to the elements.

B. Damaged or deteriorated materials shall be removed from the premises.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. STUDS AND FRAMING: Unimast, Clark Dietrich, Maverick Steel Co., Dale Industries, Delta Metals, Bostwick, American Studco Inc.

B. GYPSUM BOARD SHEATHING: United States Gypsum Co., National Gypsum Co., Domtar Gypsum, Inc. Georgia Pacific, Temple Inland.

2.2 MATERIALS

A. STRUCTURAL STUDS AND RUNNERS: Galvanized "Cee" studs in sizes and gauges as indicated in the drawings. Unless otherwise indicated in the drawings, minimum gauge shall be 16 gauge and the following structural properties shall apply:

SIZE	**ABOUT MAJOR AXIS X-X**			**ABOUT MINOR AXIS Y-Y**		
	lx	**Sx**	**rx**	**ly**	**Sy**	**ry**
3-5/8"	.906	.500	1.430	.139	.142	.614
4"	1.145	.572	1.566	.147	.143	.615
6"	3.016	1.005	2.262	.180	.149	.595
8"	6.071	1.518	2.923	.201	.152	.565

B. SHEATHING FASTENERS: Unimast self-drilling screw fasteners (bugle head).

C. SHEATHING: Fire resistant gypsum board with treated water resistant gypsum core surfaced with water repellant paper both faces –1/2" x 4' x 8' with tongue and groove joint design at long edges. Meet requirements of ASTM C-79. Provide 5/8" thick rated X core where specifically indicated on the drawings.

D. All metal studs, track, and bridging shall be formed from ASTM A-446 commercial grade steel having a minimum yield of 33,000 psi for 18 gauge and lighter members and 50,000 psi for 16 gauge and heavier members.

E. All framing components shall be galvanized. Tracks, runners, bridging and bracing shall match grade and gauge of studs.

PART 3 - EXECUTION

3.1 GENERAL

A. Install studs plumb and in plane, without twist. System installation shall be in accordance with AISI Design Manual for “Light Gauge Cold Formed Steel”.

B. All framing components shall be cut tight against abutting members. Members shall be held firmly in position until properly fastened.

C. All attachments of axial loaded framing components shall be welded in accordance with the American Welding Society’s “Recommended Practices for Resistance Welding” and shall transfer the imposed load into the adjoining member. Use no splices in axial loaded members.

D. Attachments of framing components not subject to axial loads may be welded or screw fastened.

E. Members shall be braced as required to resist all wind loads and construction loading for which the system has been designed. System shall be braced as erected and shall not be left overnight without adequate bracing.

F. Framing components used to frame openings shall be of a size and type to transfer any load imposed on the opening into the members adjacent to the opening. Additional framing shall be provided adjacent to the opening to carry the load imposed.

G. Welds in galvanized material shall be coated with “ZRC” cold galvanizing after wire brushing.

3.2 ERECTION

A. TRACK FASTENING: Secure metal floor track to concrete floor slab with Type “A” or “B” fasteners spaced as scheduled in the table below. For determining unbraced wall height, ceiling does not qualify as bracing.
   1. Type “A” fastener – minimum 5/32” diameter x 1-1/4” long powder actuated fasteners. Hilti #DS32P10 or Ramset #2335.
   2. Type “B” fastener – minimum 1/4" diameter x 2” long drilled sleeve anchor. Hilti sleeve anchor or Ramset “Thunder Nail”.
   3. Demonstrate to the Architect that fasteners can be driven full length into concrete slab tight to stud track.
   4. Use similar fasteners (and spacing) suitable for steel at overhead track or weld track to overhead steel at 12” o.c.
   5. At track splices use anchored channel inserts or fully weld.

Spacing Schedule for Type A & B Fasteners

MAX. SPACING OF FASTENERS	***MAX. UNBRACED WALL HEIGHT**	
	TYPE A	TYPE B
24”	7.4 FT.	8.3 FT.
16”	11.1 FT.	12.4 FT.
12”	14.8 FT.	16.5 FT.
8”	24.9 FT.	24.9 FT.
6”	29.7 FT.	33.2 FT.

*NOTE: Ceiling at wall does not reduce unbraced wall height.

B. STUD FASTENING: Each stud shall be fastened to top and bottom track (prior to gypsum board sheathing or interior wall finish) using one of the following two methods:
   1. Screw fastening: One self-drilling screw at the front and back faces of the top and bottom tracks for each stud (4 fasteners per stud.)
   2. Welding: One weld at the front face of the top and bottom tracks for each stud (2 welds per stud).
   3. Additional: The above minimum fasteners are required regardless of any additional bracing or intermediate fastening which may be indicated in the drawings or required.

C. BRIDGING: Provide bridging at all exterior stud walls whether or not indicated in the drawings. Unless more stringent requirements are indicated in the drawings provide the following:
   1. Wind loading resistance only: Provide multiple bridging rows spaced 5'-0" o.c. vertically maximum.
   2. Axial loaded members: For stud lengths less than 10 feet, provide 2 rows of bridging at third points. For stud lengths 10 feet and grater, provide multiple bridging rows spaced 42" o.c. vertically maximum.

D. SHEATHING INSTALLATION: Apply sheathing panels horizontally with the "v" edge turned up. Install with joints and penetrations tight and neatly fit. Stagger end joints over studs with screws spaced at maximum 12" centers at each stud and at 12" o.c. along top and bottom runners.

END OF SECTION

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Work under this section shall include all labor, materials, equipment, and accessories necessary for the fabrication and installation of all miscellaneous metal work as indicated in the drawings and as specified herein.

B. The items listed herein are not necessarily inclusive of all items required to be furnished.

1.3 SECTION REQUIREMENTS

A. Submittals: Shop Drawings showing details of fabrication and installation.

PART 2 - PRODUCTS

2.1 METALS

A. GENERAL: For the fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled or stamped trade names, and rough edges or finish.
   1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   2. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
   3. Rolled Steel Floor Plate: ASTM A 786/A 786M.
   4. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
   5. Round steel tubing and pipe are sized differently. Tubing is designated by OD and wall thickness. Pipe is designated by NPS and weight or schedule number.
   6. Steel Pipe: ASTM A 53, standard weight (Schedule 40), black finish.
   7. Shop Primer:
      a. Typical: Red Oxide or Zinc Chromate Primer conforming to Federal Specification TT-P-664C (no lead). Verify compatibility with specified finish paint.

8. Galvanizing: Hot-dip process per ASTM A-123.
9. Bolts: Comply with ASTM A-307 for standard bolts and ASTM A-325 for high strength bolts. Furnish certification that bolts are domestic orgin.
10. Pipe: Conform to ASTM A-53, Schedule 40 for steel pipe and ASTM B-429, Schedule 40 for aluminum pipe.

B. FABRICATED ITEMS: Items listed below represent principal items of miscellaneous metal fabrications required for the project. Contractor shall furnish items listed and all miscellaneous metal items indicated in the drawings or required for a complete installation.
1. Steel Pipe Railings: Schedule 40 x 1-1/2" diameter steel pipe. Provide smooth radiused bends without deformation. Provide end caps at all wall returns. Grind all welds smooth. Provide top rails in continuous lengths. Provide shop primer coat of paint compatible with schedule finish coat. Provide with cast steel wall brackets as manufactured by Julius Blum & Co. or approved equivalent.

2.2 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.3 FABRICATION

A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.

B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth with contour of welded surface matching those adjacent.

C. Fabricate steel pipe columns with steel base and top plates drilled for anchor and connection bolts and welded to pipe with continuous fillet weld same size as pipe wall thickness.

1. Provide 1/2-inch (12-mm) base plates with four 5/8-inch (16-mm) anchor bolts and 1/4-inch (6-mm) top plates.

2.4 STEEL AND IRON FINISHES

A. Hot-dip galvanized steel fabrications at exterior locations.

B. Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning," and paint with a rust-inhibitive primer complying with performance requirements of FS TT-P-664.

2.5 PAINT AND FINISHES

A. Shop prime all metal fabrications, except aluminum or stainless steel items. Shop prime galvanized items only where scheduled for finish paint. Remove rust, scale, oil, grease and other deleterious materials before application of shop paint. Provide a uniform minimum dry film thickness of 2.0 mils. Provide full coverage of joints, corners, and edges.

B. Separate dissimilar metals to protect against electrolysis. Apply a bituminous coating o approximately 30 dry mils thickness, tape or other suitable permanent separator on concealed contact surfaces of dissimilar metals.

PART 3 - EXECUTION

3.1 GENERAL: Install all items as indicated in the drawings and approved shop drawings. Coordinate installation with all affected trades. Attach members firmly in proper position that is level, plumb, and parallel to adjoining construction (except where slope is indicated).

3.2 EXPANSION JOINT COVERS: Where void is constructed in concrete slab for installation of joint cover assembly, provide reinforcing projecting from vertical walls of void into grout fill to prevent separation between concrete void and grout.

END OF SECTION 05500

SECTION 05520 - HANDRAILS AND RAILINGS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Handrails and guardrails

1.3 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Associated metal supports.

B. Section 07400 - Membrane Roofing: Coordination of roof edge protection installation.

1.4 REFERENCES

A. Americans with Disabilities Act Accessibility Guidelines (ADA).

B. American National Standards Institute (ANSI) - A21.l Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.

C. American National Standards Institute (ANSI) - A58.l Minimum Design Loads in Buildings and Other Structures.

D. American National Standards Institute (ANSI) - Al 17.1 Accessible and Usable Buildings and Facilities.

E. American Society of Testing and Materials (ASTM) A47 - Standard Specification for Ferritic Malleable Iron Castings.

F. American Society of Testing and Materials (ASTM) A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. American Society of Testing and Materials (ASTM) A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

H. Occupational Safety & Health Administration (OSHA): 1910.23 - Guarding Floor and Wall Openings and Holes.

1.5 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Drawings showing fabrication and installation of handrails and guardrails including plans, elevations, sections, details of components, anchor details, and attachment to adjoining units of work.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

A. Railings Structural Requirements:
   1. Handrail, wall rail and guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds (90719 g) applied horizontally or vertically down at any point on the top rail.
   2. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds (90719 g) applied to one square foot (8165 g/sm) at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail.
   3. Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Install in areas designated by Architect.
   2. Do not proceed with remaining work until workmanship and installation are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Materials to be delivered to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
   1. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Kee Industrial Products, Inc.,

100 Stradtman St. ; Buffalo, NY 14206; Toll Free Tel: 800-851-5181; Tel: 716-896-4949; Fax: 716-896-5696; Email: info@keeklamp.com; Web: www.keeklamp.com

B. Substitutions will be considered in accordance with provisions of Section 01600.

2.2 SYSTEMS

A. Handrails and Guardrails: Provide pipe, fittings, and accessories as indicated or required to match design indicated on the Drawings.
1. Fittings: Galvanized.
2. Handrail Pipe Size:
a. 1-1/2 inches O D (38 mm).
3. Infill Panels: As indicated, refer to Drawings.
4. Material: Galvanized pipe.
5. Style: Refer to drawings.
6. Base: Imbedded in concrete.

B. Custom Design: Provide pipe, fittings, and accessories as indicated or required by Drawings to match design indicated.

2.3 MATERIALS

A. Pipe:
1. Steel Pipe: ASTM A53 Grade B seamed tube.

B. Fittings, Including Elbows, Crossovers, Wall flanges, Tees, Couplings:
1. Galvanized Malleable Cast Iron: Kee Klamp structural pipe fittings, ASTM A447 with ASTM A153 galvanizing.
2. Aluminum Alloy: High grade aluminum silicon magnesium alloy.

C. Finish: Hot dipped galvanized, paint finish.

D. Fasteners: Type 304 or 305 stainless steel.

2.4 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Upright tops shall be plugged with weather and light resistant material.

C. Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate post setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.
1. Coordinate delivery of anchorages to project site.
2. Coordinate that blocking is in place for all mounting fasteners.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Fit exposed connections accurately together to form tight joints. For all connections with Kee Klamp fittings, each set screw is to be tightened to 29 foot pounds (39 N-m) of torque.

C. Perform cutting, drilling, and fitting required for installation of handrails. Set handrails and accurately in location, alignment, and elevation, measured from established lines and levels.

D. Set posts plumb within a tolerance of 1/8 inch (3 mm).

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install all rough carpentry, formwork, wood framing, blocking, wood furring, hardboard and related fasteners as indicated in the drawings or as required to complete the indicated construction.

B. Install all related hardware and fasteners. Provide and install wood furring and/or trim for acoustical panels.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Cast-in place concrete

B. Painting

C. Finish hardware

1.4 SECTION REQUIREMENTS

A. Submittals manufacturer’s printed literature describing wood preservatives treatment system and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.

B. Submittals manufacturer’s printed literature describing fire retardant treatment system, any structural or usage limitations, and certifying that system meets all current requirements for applicable Federal, State and local governing agencies.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 DELIVERY AND STORAGE

A. Deliver and store lumber, plywood and hardwood on sills and cover for protection.

1.7 QUALITY ASSURANCE

A. All lumber and plywood shall be grade marked by Southern Pine Inspection Bureau, West Coast Lumber Inspection Bureau, American Plywood Association, or Western Wood Products Association.

B. All lumber and plywood shall be marked with producing manufacturer’s trademark.

C. Certificate of inspection issued by grading association for bundled lumber and plywood may substitute for individual piece marking.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Dressed lumber, S4S, 15 percent maximum moisture content for 2-inch (38-mm) thickness or less, marked with grade stamp of inspection agency.

2.2 TREATED MATERIALS

A. Preservative-Treated Materials: AWPA C2 lumber and AWPA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:

1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

B. Fire-Retardant-Treated Materials: AWPA C20 lumber and AWPA C27 plywood, interior Type A treatment, labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treated lumber and plywood with bending strength, stiffness, and fastener-holding capacities that are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions.

2.3 LUMBER

A. Miscellaneous Lumber: No. 3 or Standard grade of any species for nailers, blocking, and similar members as indicated on drawings.

2.4 MISCELLANEOUS PRODUCTS

A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

1. Power-Driven Fasteners: CABO NER-272.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

B. Metal Framing Anchors: Hot-dip galvanized steel of structural capacity, type, and size indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. COORDINATION: Coordinate work with other trades and provide cutting and patching required to accommodate the work. Verify all dimensions by taking field measurements to ensure proper fit. Accurately cut framing and blocking, and fit true to line and level, avoiding shims and wedges.

B. Fit rough carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.

C. ANCHORING AND FASTENTING: Use largest practicable fasteners for each type of work. Bolt nailers and blocking to steel, masonry or concrete members using bolts of proportionate strength to members attached. Unless otherwise noted in the drawings use ¾" diameter bolts at maximum 4'-0" centers. Use concealed fasteners in finish work, set nails and use flathead countersunk screws.

D. WOOD BLOCKING: Install fire-retardant tread wood blocking between metal studs where wall-supported drinking fountains, casework, railings, and other equipment is attached. Install between studs for toilet partitions systems and toilet accessories where anchored to wall. Use minimum 2 x 4 dimension where not indicated otherwise in the drawings.

END OF SECTION 06100

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1- GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Interior standing and running trim and rails.
2. Wood cabinets (casework).
3. Laminate clad cabinets (plastic-covered casework).
4. Cabinet tops (countertops) and plastic-covered chair rails.
5. Flush wood paneling.
6. Interior door frames (jambs).

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 6 Section ‘Rough Carpentry’ for furring, blocking, and other carpentry work that is not exposed to view.
2. Division 6 Section ‘Finish Carpentry” for carpentry exposed to view that is not specified in this section.
3. Division 6 Section ‘Exterior Architectural Woodwork’ for exterior woodwork.
4. Division 8 Section “Flush Wood Doors” for doors specified by reference to architectural woodwork standards.
5. Division 9 Section “Painting” for final finishing of installed painted finish architectural woodwork.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Fire-retardant treatment data for material impregnated by pressure process to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.

D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

E. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminate (standard and premium selections).

F. Samples for verification purposes of the following:

1. Lumber with or for transparent finish, 50 square inches, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent finished woodwork.
3. Wood veneer faced panel products;, with or for transparent finish, 8-1/2 inches by 11 inches, for each species and cut with one half of exposed surface finished, with separate samples of unfaced panel product used for core.
4. Lumber and panel products with factory-applied opaque finish, 8- 1/2 inches by 11 inches for panels and 50 square inches for lumber, for each finish system and color, with one half of exposed surface finished.
5. Laminate clad panel products, 8-1/2 inches, by 11 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
6. Corner pieces as follows:
   a. Cabinet front frame joints between stiles and rail as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.
7. Exposed cabinet hardware, one unit of each type and finish.

G. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

H. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Single-Source Responsibility: Arrange for production by a single firm of architectural woodwork with sequence matched wood veneers.

1. Include the veneering of wood doors in the single-firm production, where veneer matching extends across wood doors.

C. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

D. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

E. AWI Quality Standard Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

F. Hardware Coordination Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to manufacturer of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in 'Project Conditions.'

1.06 PROJECT CONDITIONS

A. Environments1 Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2- PRODUCTS

2.01 HIGH PRESSURE DECORATIVE LAMINATE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high pressure decorative laminates (standard and premium selections) which may be incorporated in the work include:

1. Formica Corp.
2. Nevamar Corp.
3. WilsonArt

2.02 MATERIALS

A. General: Provide materials that comply with requirements of the AWl woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Medium Density Fiberboard: ANSI A208.2.
4. Particleboard ANSI A208.1
5. Softwood Plywood PS 1.

B. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:

1. Particleboard: NPA 8.
2. Medium Density Fiberboard: NPA 9.
3. Hardwood Plywood: HPMA FE.

C. Fire-Retardant Particleboard: Where indicated, provide panels complying with the following requirements that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for flame spread of 20 or less and for smoke developed of 25 or less per ASTM B 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. For 45-lb-density panels and thicknesses of 3/4 inch and less, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of elasticity and screw-holding capacity on face and edge shall be 300,000 psi, 250 lb, and 225 lb, respectively.
2. For 44-lb-density panels and thicknesses of 13/16 inch to 1-1/4 inch, comply with ANSI A208.1 for Grade 1-M-1 except that minimums for modulus of rupture, modulus of elasticity, internal bond, linear expansion, and screw-holding capacity on face and edge shall be 1300 psi, 250,000 psi, 60 psi, 0.50 percent, 250 lb, and 175 lb, respectively.
3. Product: Subject to compliance with requirements, provide “Duraflake FR” by Duraflake Div.; Willamette Industries, Inc.

2.03 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. 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 less than 1 inch in nominal thickness: 1/16 inch.
2. Edges of rails and similar members more than 1 inch in nomina1 thickness: 1/8 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to minimum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-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. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.04 FIRE-RETARDANT-TREATED LUMBER

A. General: Where indicated, pressure impregnate lumber with fire-retardant chemicals of formulation indicated to produce materials with fire performance characteristics specified.

B. Fire-Retardant Chemicals: Use chemical formulations specified that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.

1. Organic Resin-Based Formulation: Exterior type per AWPA C20 consisting of organic-resin solution, relatively insoluble in water, thermally set in wood by kiln drying.
2. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.

C. Fire Performance Characteristics: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with c1assification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.

1. Surface Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion.

a. Flame Spread: 25.
b. Smoke Developed: 50.

D. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting organization.

E. Mill lumber before treatment and implement special procedures during treatment and drying processes that are needed to prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

F. Kiln-dry woodwork after treatment to levels required for untreated woodwork. Maintain moisture content required by kiln drying before and after treatment.

G. Discard treated lumber that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

H. Products: Subject to compliance with requirements, provide one of the following:

1. Low-Hygroscopic Formulation (Type A):

a. “Flameproof LHC”; Osmose Wood Preserving, Inc.
b. “Dricon”; Hickson Corporation.

2.05 STANDING AND RUNNING TRIM AND RAILS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 300.

B. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.

C. Assemble casings in plant except where limitations of access to place of installation require field assembly.

D. Grade: Premium.

E. Lumber Species: Birdseye Maple, half round.

2.06 STANDING AND RUNNING TRIM AND RAILS FOR OPAQUE FINISH

A. Quality Standard: Comply with AWI Section 300.

B. Grade: Premium.

C. Backout or groove backs of flat trim members and kerf backs of other wide flat members, except for members with ends exposed in finished work.

D. Assemble casing in plant except where limitations of access to place of installation require field assembly.

E. Lumber Species: Any dosed-grain hardwood listed in referenced woodworking standard.

2.07 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 and its Division 400A Wood Cabinets."

B. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Wood Species for Exposed Surfaces: Maple, rotary cut veneer.

1. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Slip match.
3. Veneer Matching Within Panel Face: Balance match.

E. Wood Species for Semiexposed Surfaces: Match species and cut indicated for exposed surfaces.

2.08 LAMINATE CLAD CABINETS (PLASTLC.COVERED CASEWORK)

A. Quality Standard. Comply with AWI Section 400 and its Division 400B 'Laminate Clad Cabinets."

B. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay, unless otherwise indicated.

D. Laminate Cladding High pressure decorative laminate complying with the following requirements:

1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

a. Provide selections made by Architect from laminate manufacturer's full range of standard and premium colors and finishes in the following categories:

(1) Solid colors.
(2) Patterns.

2. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.

a. Horizontal Surfaces Other Than Tops: GP-50 (0.050-inch nominal thickness).
b. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
c. Edges: GP-50 (0.050-inch nominal thickness).

3. Semiexposed Surfaces: Provide surface materials indicated below:

a. High pressure laminate, GP-28.

2.09 CABINET HARDWARE AND ACCESSORY MATERIAI.8

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section 'Door Hardware.'

B. Cabinet Hardware and Miscellaneous Item Schedule:

1. Adjustable Shelf Standard.

a. Manufacturer/Model No.: Knape & Vogt/No. 255.
b. Size/Type: 5/8" wide x 3/16" deep, recessed.
c. Finish: Bright zinc plate.
d. Remarks: 1/2" vertical adjustment.

2. Adjustable Shelf Support:

a. Manufacturer/Model No.: Knape & Vogt/No. 256.
b. Finish: Bright zinc plate.
c. Remarks: For use with No. 255 standard.

3. Slotted Shelf Standard:

a. Manufacturer/Model No.: Knape & Vogt/No. 51.
b. Size/Type: 3/4" x 3/8" x length shown, surface mount, heavy duty.
c. Finish: Bright nickel plate.
d. Remarks: 1-5/8" vertical adjustment.

4. Adjustable Shelf Bracket:

a. Manufacturer/Model No.: Knape & Vogt/No. 52.
b. Size/Type: 112" wide x shelf depth.
c. Finish: Bright nickel plate.
d. Remarks: For use with No.51 standard.

5. Drawer Slide: (Typical)

a. Manufacturer/Model No.: Grant/No. 329.
b. Size/Type: Full extension, length to suit drawer.
c. Finish: Zinc plate.
d. Remarks: 100 lb. rating.

6. Drawer Slide: (To 4-1/2" drawer depth)

a. Manufacturer/Model No.: Grant/No. 328.
b. Size/Type: Full extension, length to suit drawer.
c. Finish: Zinc plate.
d. Remarks: 50 lb. rating.

7. Knobs (at Suites Level):

a. Forms + Surfaces Model No. HC430 Series, sizes as selected by Architect from manufacturers standards.
b. Finish: Anodized black matte.

8. Wire Pulls:

a. Manufacturer/Model No.: Stanley/No. 4483112
b. Size/Type: 3-1/2" center wire pulls.
c. Finish: US 28D.

9. Concealed Hinges:

a. Manufacturer/Model No.: Stanley/No. 1510.

10. Continuous Hinges:

a. Manufacturer/Model No.: Stanley/No. STS311-1/4.
b. Size/Type: 1-1/2" wide x height of door.
c. Finish: US 32.
d. Remarks: Provide matching countersunk screws, 2" o.c., both sides.

11. Door Catch (Magnetic type)

a. Manufacturer/Model No.: Stanley/No. SP4L
b. Size/Type: 2" x 1-1/4" case size.
c. Finish: Aluminum.
d. Remarks: One per leaf to 48", two per leaf to 84".

12. Cabinet Lock

a. Manufacturer/Modal No.: National/No. C-8053.
b. Size/Type: Disc tumbler cam lock.
c. Finish: US 26D or US 32D.
d. Remarks: Furnish two keys per lock; keyed to Building Standard.

13. Sliding Glass Door Locks: K&V 965NP, keyed to building system.
14. Track, Upper Guide & Sheaves: Stylmark Model No. 810005 Assembly, 204-Ri clear anodized finish.

C. Hardware Standard Comply with ANSI/BEMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BIIMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

1. Dark Oxidized Satin Bronze, Oil Rubbed, on Bronze Base: BHMA 613 and matching Architect's sample.
2. Satin Chromium Plated, Brass or Bronze Base: BHMA 626.

3. Satin Chromium Plated, Steel Base: BHMA 652.
4. Satin Stainless Steel, Stainless Steel Base: BHMA 630.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSJ/BHMA A156.9.

F. Clear Tempered Float Glass for Shelves: ASTM C 1048, Condition A, style I, type I, quality q3, class 1, seamed at edges before tempering, 1/4-inch thick unless otherwise indicated.

2.10 ARCHITECTURAL CABINET TOPS (COUNTERTOPS) AND CHAIR RAILS:

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top and Chair Rail: High pressure decorative laminate complying with the following:

1. Grade: Custom.
2. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:

a. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

(1) Provide selections made by Architect from manufacturer's full range of standard and premium colors and finishes in the following categories:

(a) Solid colors.
(b) Patterns.

b. Grade: GP-50 (0.050-inch nominal thickness).
c. Edge Treatments:

(1) Plastic Laminate Edge Treatment: Same as laminate cladding on horizontal surfaces.
(2) Wood Edge Treatment: Lumber edge for transparent finish, with matching wood species and cut to be determined.

2.11 FLUSH WOOD PANELING FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 500 and its Division 500A.

B. Grade: Premium.

C. Veneer Species: Birdseye Maple half round.

D. Matching of Adjacent Veneer Leaves: Slip match.

E. Veneer Matching Within Panel Face: Best match.

F. Fire Performance Characteristics: Provide paneling composed of panels of wood veneer density and fire-retardant particleboard that are identical in construction to units tested for the following surface burning characteristics per ASTM E 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify panels with appropriate markings of applicable testing and inspecting organization on surfaces that will be concealed from view after installation.

1. Flame Spread: 75 or less.
2. Smoke Developed: 40 or less.

2.12 INTERIOR DOOR FRAMES FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 900B.

B. Grade: Premium.

C. Lumber Species: Maple, rotary cut veneer.

2.13 CLOSET AND UTILITY SHELVING:

A. Quality Standard: Comply with Section 600.

B. Shelving for Painted Finish (By Section 09900): Comply with the following requirements:

1. Grade: Economy.
2. Shelving Material: Maple faced veneer core plywood.
3. Lumber: Ponderosa Pine or Poplar.

2.14 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal framing manufacturer.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by 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 bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.15 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.

1. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation. Painted finish by Section 09900 except prime coat.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and simi1ar preparations for finishing of architectural woodwork, as applicable to each unit of work.

D. Transparent Finish for Closed-Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect, and sheen.

1. Grade: Premium.
2. AWI Finish System #5: Catalyzed polyurethane.
3. Staining for Cherry Only: Match approved sample for color.
4. Effect: Open grain (not filled).
5. Sheen: Dull satin 15-20 deg.

E. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen:

1. Grade: Premium.
2. AWI Finish System #11: Catalyzed polyurethane.
3. Color: Match Architect's sample.
4. Sheen: Medium-gloss rubbed effect 35-45 deg.

2.16 MISCELLANEOUS ACCESSORIES

A. Steel Countertop Support Bracket: provide prefinished steel bracket supports at locations as shown on drawings. Brackets shall be by A&M Hardware (888) 647-0200 info@aandmhardware.com Other equal products may be provided if and as specifically approved by Architect by substitution request during bidding period. Reference 01600 Substitution Procedures.

PART 3- EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

B. Quality Standard. Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

C. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 118 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

D. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood. Handle, store, and install fire- retardant-treated wood to comply with recommendations of chemical treatment manufacturer including those for adhesives where are used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

G. Standing and Running Trim and Rails: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns and miter at corners.

H. Cabinets: Install without distortion so that 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 the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish

I. Tops: Anchor securely to base units and other support systems as indicated.

J. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

K. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

L. Refer to the Division 9 sections for finishing of painted architectural woodwork.

3.03 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

END OF SECTION 06402

SECTION 06650 - SOLID SURFACING

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. Section Includes:
1. Gibraltar Solid Surface Material.
2. Earthstone Solid Surface Material.
3. Solid Surface Material Shaped Goods (Wilsonart Sinks).

B. Related Sections:
1. Finish Carpentry: Section 06100.
2. Architectural Woodwork: Section 06402.
3. Sealants: Section 07920.
4. Door Thresholds at Ceramic Tile: Section 09300.
5. Plumbing: Division 15.

1.2 SYSTEM DESCRIPTION

A. Gibraltar Solid Surface Sheet: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.

B. Earthstone Solid Surface Sheet: Homogenous sheet material composed of acrylic resins, fire-retardant filler materials, and coloring agents.

C. Solid Surface Shaped Goods (Wilsonart Sinks): Cast items of homogenous material composed of polyester and acrylic resins, fire-retardant filler materials, and coloring agents.

1.3 SUBMITTALS

A. Comply with Section 01340, unless otherwise indicated.

B. Product Data:
1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Manufacturer's detailed recommendations for handling, storage, installation, protection, and maintenance.

C. Shop Drawings: Installation details including location and layout of each type of fabrication and accessory.

D. Samples: Full range of standard colors and patterns.

E. Contract Closeout Submittals: Comply with Contract Documents.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Wilsonart certified solid surface fabricator/installer.

B. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, including specific requirements indicated.

1. Acceptable to or licensed by manufacturer.

C. Source Limitations: Obtain materials and products from single source.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fabrications appropriately wrapped in protective materials.

B. Protect fabrications from damage.

1.6 PROJECT CONDITIONS

A. Maintain relative humidity planned for building occupants and an ambient temperature between 65 and 75 degrees Fahrenheit for 48 hours prior to and during installation. After installation, maintain relative humidity and ambient temperature planned for building occupants.

1.7 WARRANTY

A. Furnish manufacturer’s limited 10 year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Wilsonart International, (800) 433-3222, www.wilsonart.com.
1. Gibraltar Solid Surface, Type 051.
2. Earthstone Solid Surface, Type 051.

B. Substitutions: Permitted, in accordance with Section 01600 Substitution Procedures.

2.2 GIBRALTAR SOLID SURFACE SHEET

A. Nominal sheet thickness: 0.50 inch (13 mm)
B. Surface burning characteristics in accordance with ASTM E 84: Class I or A, and as follows:
1. Flame spread: < 25.
2. Smoke developed: <25.
C. Liquid Absorption, ISO 4586-2, for 1/2 inch material thickness: 0.4 percent after 2 hour period.
D. Izod Impact, ASTM D 256, Method A: 0.3 foot pounds per inch.
E. Tensile Modulus, ASTM D 638 Nominal: 1.2 million pounds per square inch.

F. Thermal Expansion, ASTM D 696: 0.000018 inch per inch per degree F, maximum.
G. Hardness, ASTM D 2583, Barcol Impressor: 57.
H. Flexural Toughness, ASTM D 790: 3 (in.-lb,/in³).
I. Deflection Temperature under load, ASTM D 648: 90 degrees C.
J. Stain Resistance, ANSI Z-124.3 Modified; 3.4: No effect.
K. Boiling Water Resistance, NEMA LD 3-3.05: No effect.
L. High Temperature Resistance, NEMA LD 3-3.06: No effect.
M. Radiant Heat Resistance, NEMA LD 3-3.10: No effect.
N. Light Resistance, NEMA LD 3-3.03: No effect.
O. Ball Impact Resistance, NEMA LD 3-3.08, one half pound ball, unsupported: 125 inches.
P. Specific Gravity (Density ASTM D792): 1.60 grams per cubic centimeter.
Q. Approximate weight: 4.20 pounds per square foot.
R. Weatherability, ASTM D 2565: Pass.
S. Fungus Resistance, ASTM G 21: Pass.
T. Bacterial Resistance, ASTM G 22: Pass.
U. Pittsburgh Protocol Toxicity: 66.9 grams.
V. Patterns and Finishes: Selected from manufacturer's full range of available selections by Architect. Provide Bullnose Edge as indicated on drawings.

2.3 EARTHSTONE SOLID SURFACE SHEET

A. Nominal sheet thickness: 0.50 inch (13 mm).
B. Surface burning characteristics in accordance with ASTM E 84: Class II or B, and as follows:
   1. Flame spread: < 26.
   2. Smoke developed: < 35.
C. Liquid Absorption, ISO 4586-2, for 1/2 inch material thickness: 0.4 percent after 2 hour period.
D. Izod Impact, ASTM D 256, Method A: 0.3 foot pounds per inch.
E. Tensile Modulus, ASTM D 638 Nominal: 1.1 million pounds per square inch.
F. Thermal Expansion, ASTM D 696: 0.00002 inch per inch per degree F, maximum.
G. Hardness, ASTM D 2583, Barcol Impressor: 57.
H. Flexural Toughness, ASTM D 790: 5 (in.-lb,/in³).
I. Deflection Temperature under load, ASTM D 648: 90 degrees C.
J. Stain Resistance, ANSI Z-124.3 Modified; 3.4: No effect.
K. Boiling Water Resistance, NEMA LD 3-3.05: No effect.
L. High Temperature Resistance, NEMA LD 3-3.06: No effect.
M. Radiant Heat Resistance, NEMA LD 3-3.10: No effect.
N. Light Resistance, NEMA LD 3-3.03: No effect.
O. Ball Impact Resistance, NEMA LD 3-3.08, one half pound ball, unsupported: 125 inches.

P. Specific Gravity (Density ASTM D792): 1.56 grams per cubic centimeter.
Q. Approximate weight: 4.10 pounds per square foot.
R. Fungus Resistance, ASTM G 21: Pass.
S. Bacterial Resistance, ASTM G 22: Pass.
T. Pittsburgh Protocol Toxicity: 65.4 grams.
U. Patterns and Finish: Selected from manufacturer's full range of available selections by Architect. Provide Bullnose Edge as indicated on drawings.

2.4 ACCESSORY MATERIALS

A. Joint adhesive: Manufacturer’s standard adhesive to create inconspicuous, nonporous joints, with a chemical bond (WA8215).

B. Sealant: Standard mildew resistant, FDA/UL recognized silicone sealant in color matched or clear formulations.

C. Sink/bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.5 FABRICATION

A. Fabrication to be performed by a Wilsonart certified solid surface fabricator/installer.
B. Fabricate components in shop to greatest extent practical to size and shape indicated, in accordance with approved shop drawing and Wilsonart published requirements.
C. Wilsonart Solid Surface Fabrication Manual (SS0319)
D. Provide Bullnose Edge as indicated on drawings.
E. Form joints between components using manufacture’s standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 4" (100mm) wide Gibraltar/Earthstone reinforcing strip under joints required by Deck Seam Section of the Wilsonart Solid Surface Fabrication Manual (SS0319).
F. Provide holes and cutouts for plumbing and bath accessories as indicated on shop drawings.
G. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts then sand all edges smooth. Repair or reject defective or inaccurate work.
H. Finish: Surfaces shall have a uniform finish.

1. Matte: Standard finish for high traffic areas, requires the least amount of maintenance.
2. Satin: Standard finish for darker Gibraltar and Earthstone patterns, requires minimal maintenance.
3. Semi-gloss: Higher sheen with greater reflectance, suggested for lower traffic areas, requires increased maintenance
4. Gloss: Maximum sheen and reflectance, recommended for light traffic areas or vertical applications.

I. Thermoforming (optional): Comply with forming data from manufacturer.
1. Construct matching molds to form components shape.
2. Form pieces to shape prior to seaming and joining.
3. Cut pieces larger than finished dimensions, sand edges, remove all nicks and scratches.
4. Heat entire component uniformly between 280°–325°F during forming.
5. Prevent blistering, whitening or cracking of Gibraltar/Earthstone during forming.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surfacing. Identify conditions detrimental to proper or timely installation. Do not commence installation until conditions have been corrected.

3.2 PREPARATION

A. Precondition Wilsonart Solid Surfacing in accordance with manufacturer’s printed installation instructions.

3.3 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings, project installation details and manufacturer’s printed instructions.

B. Form joints using manufacturer's approved adhesive, with joints inconspicuous in finished work.
C. Adhere undermount sinks/bowls to countertop using manufacturer's recommended joint adhesive.
D. Adhere topmount sinks/bowls to countertop using manufacturer's recommended adhesive/silicone sealant.
E. Provide backsplashes, endsplashes and bullnose edge as indicated on the drawings. Adhere to countertops using manufacturer's recommended silicone sealant.
F. Remove excessive adhesive and sealants. Components shall be clean on Date of Substantial Completion.
G. Coordinate plumbing installation with Division 15.

3.4 INSTALLATION OF WINDOW STOOLS

A. Install window stools full length of window, set securely into place using only concealed fasteners and manufacturer's approved adhesive.
B. Window stools shall be plumb, true and level.
C. Provide minimum 1/8″ expansion gaps on both sides of window stools, sealed with Manufacturer's approved sealant.
D. Ease edges and sand smooth.

3.5 INSTALLATION OF VANITIES

A. Install plumb, level, true and straight. Shim as necessary using concealed shims.
B. Attach top securely to base unit or support brackets in accordance with manufacturer's printed instructions.
C. Seal between wall and component with manufacturer's recommended silicone sealant.
D. Attach backsplashes and endsplashes to countertops using manufacturer's recommended silicone sealant.

3.6 PROTECTION

A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged components that cannot be repaired to architect's satisfaction.
B. Fabricator/Installer to provide the Wilsonart® Care and Maintenance kit, review maintenance procedures and the Wilsonart warranty with the head of maintenance upon completion of project.

END OF SECTION

SECTION 07100 — DAMPPROOFING AND WATERPROOFING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install below-grade waterproofing.

B. Provide and apply dampproofing on weather side of inside wythe of all exterior masonry cavity walls.

C. Provide and apply dampproofing and joint taping on weather side of gypsum board sheathing.

D. Provide and install membrane waterproofing (flashing) at exterior walls as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Unit masonry.

B. Gypsum sheathing.

C. Flashing at roof.

D. Plastic membrane under slab-on-grade.

E. Waterstops.

F. Metal thru-wall flashing.

1.4 SUBMITTALS

A. Submit manufacturer’s printed literature describing each material, restrictions, and manufacturer’s recommended procedures. Submit samples of each material.

B. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the Work under this section for a period of one year after the date of Substantial Completion of the Project.

1.6 QUALITY ASSURANCE

A. Waterproofing company shall have a minimum of 3 years experience in the dampproofing and waterproofing of building structures of similar size and scope as this project.

B. Retain at the job site a properly calibrated gauge for use by the Architect to verify applied thickness of materials.

PART 2 - PRODUCTS

2.1 WALL MATERIALS

A. MEMBRANE FLASHING: 40 mil thick polyethylene backed SBS modified bitumen self-adhering black membrane; “Protecto Flash” as manufactured by Protecto Wrap Co. or “Perm-A-Barrier” as manufactured by W.R. Grace and Co. or “Blueskin SA” as manufactured by Henry Company. Membrane shall comply with the following:

1. Tensile Strength: ASTM D412; 1400 psi.
2. Elongation: ASTM D412; 200% min.
3. Water Absorption: ASTM D570; 0.1% max.

B. DAMPPROOFING: Non-asbestos, Tyvek Fluid Applied Weather Barrier. Comply with ASTM E96-00 and ASTM E2178.

C. SHEATHING TAPE: 4” wide glass fabric scrim complying with ASTM D1668 or 40 mil thick polyethylene backed SBS modified bitumen self-adhering tape as manufactured by Protecto Wrap Co. or equivalent by W.R. Grace and Co or Henry Company. Verify compatibility of tape with proposed dampproofing.

2.2 BELOW GRADE WATERPROOFING:

A. WALLS: “Hydrocide Liquid Membrane 5000T”, one part cold applied elastometric, modified urethane. Trowel applied, non-sag, as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

B. SLABS: “Hydrocide Liquid Membrane, HLM 5000” Cold Applied Seamless Elastomeric, Modified Urethane for use between concrete seal slab and concrete slab-on-grade as manufactured by Sonneborn or approved equivalent by Toch Bros. or Tremco or Henry Company.

C. PROTECTION BOARD: Water-resistant, semi-rigid panel composed of a core of asphalt and inorganic mineral filler particles, bottom reinforcing cover of asphalt-saturated felt and top cover of fiber glass mat weather-coated with a bond-breaking film, as manufactured by W.R. Meadows, Inc or Henry Company.

D. WATERSTOPS: Reference concrete section.

2.3 SHOWER PANS:

A. MEMBRANE SHOWER PAN: 30 mil thick synthetic, heavy-duty, flexible membrane PVC sheet, Nervastral 300.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall inspect exterior face of all masonry cavity walls to ensure that all penetrations and joints are completely filled prior to dampproofing operations beginning.

3.2 MEMBRANE FLASHING

A. Prime concrete and masonry surfaces scheduled to receive membrane flashing using flashing manufacturer's recommended primer to ensure good adhesion.

B. WALL FLASHINGS: Shall be installed above all openings occurring in an exterior wall, at base of exterior wall, and at wall interruptions by columns, beams, slabs, spandrels and other locations as indicated in the drawings. Flashing shall extend to within 1" of outside face of wall, shall be continuous and shall extend through cavity and be turned up to the top first course above finish floor on face of inner wythe, and to extend 1" minimum into back up or inner wythe. End laps to be 9" and side laps 6".

C. STEEL STRUCTURE: Cover all steel columns or beams in exterior walls not protected by dampproofed concrete block or sheathing. Cover steel completely with membrane flashing lap 6" on to masonry on each side of columns. Conform and adhere to steel shapes not fireproofed. Cover all protruding angles or miscellaneous steel.

D. FRAMES: Install at exterior window and door frames and other locations as indicated in the drawings.

E. SHEATHING: Wrap all corners of gypsum board sheathing. See drawings for other details.

3.3 SHEATHING TAPE: Use one of the following systems:

A. Imbed and cover glass fabric scrim tape in dampproofing mastic at all joints, cracks and penetrations at gypsum board sheathing.

B. Apply specified self-adhering tape continuously over all joints, cracks and penetrations prior to beginning dampproofing operations.

3.4 DAMPPROOFING

A. Spray or brush apply dampproofing coating to weather side of all gypsum sheathing and primed concrete block back-up at exterior masonry cavity walls in accordance with the following:
   1. Primer: Minimum ½ gallon material per 100 sq. ft. of wall surface.
   2. Coating: **Minimum 2/32" (62.5mils)** dry film thickness and minimum 5 gallons material per 100 sq. ft.

B. Cover all corners and work thoroughly into all joints, cracks, or crevices. Finished coating shall be monolithic and free of pin holes or cracks. Seal cracks, voids and joints at dissimilar materials with glass fabric embedded in dampproofing coating.

C. Seal around penetrations including all masonry anchors.

D. Dampproofing shall be applied only when temperature is at 50 degrees F. and rising or above, and when no rain is forecast for the 24 hour period following application. No dampproofing shall be covered by masonry prior to observation by the Architect. All dampproofing shall dry for a minimum of 24 hours prior to being covered by finish masonry.

3.5 BELOW GRADE WATERPROOFING

A. LIQUID MEMBRANE:

1. Install liquid membrane systems at earth side of all below grade walls, between sub-slab ("mud-slab") and structural slab, and all outside surfaces of elevator pit. Allow concrete work to cure a minimum of 14 days. All surfaces shall be smooth, dry, sound and free of honeycombs. Concrete shall be free of curing and parting compounds, wax or other foreign materials.
2. Static joints or cracks less than 1/8" wide shall be sealed with "HLM" as manufactured by waterproofing manufacturer. Material shall fill and over-lap the edges of the joint to a width of 4" on both sides and shall have a minimum surface thickness of 55 (+5) mils.
3. Immediately prior to application of membrane, remove all dust and dirt by use of high-pressure air, by brushing with a soft broom or vacuum cleaning.
4. Apply material at a rate of 4 gallons per 100 square feet of surface to produce a membrane of 55 (+5) mil thick. Carefully control application to avoid runs and sags of fresh material.
5. Apply membrane to prestripped areas at cracks, joints, intersections, penetrations, etc., to provide a minimum total thickness of 110 mils over these areas. Mask any membrane edge exposed to view to provide a straight clean edge.
6. Before the membrane attains a final set, verify the applied thickness by use of a mil-thickness gauge. Where readings indicate a thickness less than specified, immediately apply additional membrane to produce required thickness.
7. Following the application of the membrane, place protection boards over the membrane waterproofing at walls receiving backfill. Use membrane material as required to adhere protection boards. Boards shall be firmly in place with joints closely butted and sealed with gusset tape before backfilling is started.
8. Protect membrane during construction. Any punctures or cuts in the membrane shall be patched and sealed in the manner described above for sealing joints in the sheeting.

3.6 SHOWER PANS

1. Ensure that surfaces receiving shower pan are clean, thoroughly dry and free from rough surfaces and sharp projections.
2. One-ply of 30 mil sheet shall be applied over concrete surface by embedding it in a coat of Nerva-Plast mastic trowel-applied at a rate of 40 sq. ft. per gallon. Turn up perimeter a minimum of 4".
3. Seal joints with 3" and final 2" wide strips of Nervastral tape in accordance with manufacturer's recommendations. Preform all corners and make without joints.
4. Roll entire horizontal area with 50 to 100 lb. Roller. Set corners and turn-ups with rubber roller.

END OF SECTION 07100

SECTION 07210 — BUILDING INSULATION

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install fiberglass roll or batt insulation as indicated in the drawings.

B. Provide and install fiberglass batt insulation at certain exterior stud walls as indicated in the drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Unfaced acoustical insulation in drywall partitions.

B. Piping and duct insulation.

1.4 SUBMITTALS

A. Submit manufacturer’s product data describing materials and “R” values.

B. Submit insulation manufacturer’s written approval of proposed cavity wall insulation mastic to be used over specified dampproofing.

C. Reference Section 01340 SUBMITTALS for additional submittal requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. BATT OR ROLL INSULATION: As manufactured by Certainteed, Owens-Corning, Manville, or Celotex.

1. General: Insulation shall be fine fiber, flexible, resilient glass fiber blanket. Moisture absorption shall be less than .2% by volume.

2. Interior Metal Stud Walls: 4" x 16" wide x (full height of wall) sound attenuation batts "R" factor 11. Unfaced.

3. Metal Stud Walls at Perimeter: 4" x 16" wide x (full height of wall) sound attenuation batts "R" factor 11. Unfaced.

4. Wood Stud Walls at Existing Corridor: 6" x 16" wide x (full height of wall) batts, "R" factor 19. Unfaced interior side. Exterior side shall be foil faced or Kraft paper faced.

5. Above Acoustical Ceiling Panels: Thermal Batt Insulation Kraft faced fiberglass. "R" factor 19.

PART 3 - EXECUTION

3.1 INSTALLATION

A. WALL INSULATION:

1. New Exterior Wood Stud Walls (Corridor): Install between wood studs with snug fit. Install roll or batts continuous from floor to overhead structure. Place vapor barrier face toward exterior of building. Leave 1" space around electrical boxes.

B. ACOUSTICAL BATTS: Unfaced acoustical batts in interior partitions provided under Drywall Section 09250.

END OF SECTION - 07210

SECTION 07214 - FOAMED-IN-PLACE MASONRY WALL INSULATION

PART 1 - GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. Extent of insulation work shall be on all exterior cmu walls, as shown on drawings, and indicated by provisions of this section.

B. Applications of insulation specified in this section include the following:
1. Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.02 SUBMITTALS

A. Product and technical presentation as provided by the manufacturer.

B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.

C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.03 QUALITY ASSURANCE

A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.

B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.

C. Warranty: Upon request, a one year product and installation warranty will be issued by both the manufacturer and installer.

D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

Product must be classified by Underwriters Laboratory ® ("UL") as to Surface Burning Characteristics

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Combustion Characteristics:	ASTM E-136

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:

a. "Core-Fill 500™"; Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28603, (800) 627-1687
b. Or approved equal. Refer to 01600 Substitution Procedures.

2.02 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

1. Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-119) for 8" and 12" concrete masonry units when used in standard two (2) hour rated CMUs.
2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
3. Combustion Characteristics: Must be noncombustible, Class A building material.
4. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
5. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E 90-90).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Application Assemblies:

Block Walls:	6", 8", 10" or 12" concrete masonry units
Cavity Walls:	2" cavity or greater

3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.

B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

END OF SECTION

SECTION 07260 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.

B. Related sections:
   1. Section 03 30 00 Cast-in-Place Concrete
   2. Section 07 26 00 Vapor Retarders

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745- 11Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643- 11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E 1745.
   2. Manufacturer’s samples and literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all of the following qualities:
1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
a. Strength: ASTM E1745 Class A.
b. Thickness: 15 mils minimum

B. Vapor barrier products:
1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.

2. Substitutions will be in accordance with Section 01600.

2.2 ACCESSORIES

A. Seams :
1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC, (887) 464-7834 www.stegoindustries.com.
2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
3. StegoTack Tape (double sided) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
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.
3a. Seal vapor barrier to slab perimeter/edge using Stego Crete Claw and remove dirt, debris, and mud from Crete Claw prior to concrete placement.
OR
3b. Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
4. Overlap joints 6 inches and seal with manufacturer's tape.
5. Apply tape/Crete Claw to a clean and dry vapor barrier.
6. Seal all penetrations (including pipes) per manufacturer's instructions.

7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

END OF SECTION

SECTION 07321 - CONCRETE ROOF TILES

PART 1 GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION INCLUDES

A. Concrete roof tiles.

B. Metal roof flashing.

C. Underlayments and self seal membrane.

D. Related roof accessories.

1.3 RELATED SECTIONS

A. Section 06100 - Rough Carpentry; Roof sheathing and nailers.

B. Section 06200 - Finish Carpentry.

C. Section 07530 - Elastomeric Sheet Roofing.

D. Section 07600 - Flashing and Sheet Metal.

E. Section 07710 - Roof Specialties; Roof gutters and downspouts.

F. Section 08600 - Skylights.

G. Division 15 - Mechanical: Mechanical work projecting through roof.

H. Division 16: - Electrical: Electrical work projecting through roof.

1.4 REFERENCES

A. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.

D. ASTM C 387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.

E. ASTM C 887 - Standard Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar.

F. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

G. ASTM D 2626 - Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing.

H. ASTM D 2822 - Standard Specification for Asphalt Roof Cement.

I. ICBO-ES AC48 - Acceptance Criteria for Roof Underlayment for Use in Severe Climate Areas; 2000.

J. NRCA - Steep Roofing Manual; National Roofing Contractors of America.

K. SMACNA - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors National Association.

1.5 DESIGN REQUIREMENTS

A. Performance Requirements: Provide roof tile system designed for sunbelt weather conditions and the following;
1. Very Low Slope Roofs: Pitch less than 3 in 12.
2. Medium Slope Roofs: Pitch 3 in 12 to 10 in 12.
3. Steep Roofs: Pitch greater than 10 in 12 but less than 18 in 12.
4. Very Steep Roofs: Pitch of 18 in 12 or greater.
5. Basic wind conditions up to 80 miles per hour.
6. High wind conditions up to 130 miles per hour.
7. Roof height greater than 40 feet.

B. Performance Requirements: Provide roof tile system designed for severe weather conditions and the following;
1. Very Low Slope Roofs: Pitch less than 4 in 12.
2. Medium Slope Roofs: Pitch 4 in 12 to 10 in 12.
3. Steep Roofs: Pitch greater than 10 in 12 but less than 18 in 12.
4. Very Steep Roofs: Pitch of 18 in 12 or greater.
5. Basic wind conditions up to 80 miles per hour.
6. High wind conditions up to 130 miles per hour.
7. Roof height greater than 40 feet.
8. Heavy snow loads.

C. Roofing tile materials and installation shall conform to the requirements of the applicable building code.

1.6 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Product Data: Manufacturer's descriptive literature for products specified in this section.

C. Shop Drawings: Indicate metal flashing profiles, joint locations, fastening locations, and installation

details. Indicate tile layout with location of cut and special shaped tiles identified.

D. Verification Samples: Three full tile units indicating color, style, and features.

E. Manufacturer's Instructions: Printed installation instructions for roof tile; include the following:
1. Fastening schedules for specified tile types and indicated roof slopes.
2. Instructions for installation procedures for specified project conditions.
3. Manufacturer's Safety Data Sheets (M.S.D.S.) for solvent-based products.

F. Warranty documents, issued and executed by manufacturer of roof tile, countersigned by Contractor.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five years documented experience producing concrete roof tile and member of National Tile Roofing Manufacturer's Association.

B. Installer Qualifications: Minimum five years documented experience installing products specified in this section and/or supervision by a manufacturers authorized installation representative.

C. Mock-Up:
1. Construct mock-up using materials specified in this section.
2. Construct mock-up as directed, at location indicated or directed.
3. Construct mock-up at location indicated or directed, **size 6 feet by 6 feet**.
4. Obtain Architect's acceptance of mock-up before beginning construction activities of this section; accepted mock-up will be standard by which completed work of this section is judged.
5. Mock-up may **not** remain as part of Work.
6. **Accepted** mock-up may remain as part of Work.

D. Pre-Installation Meeting:
1. Convene at job site seven calendar days prior to scheduled beginning of construction activities of this section to review requirements of this section.
2. Require attendance by representatives of the following:
a. Installer of this section.
b. Other entities directly affecting, or affected by, construction activities of this section.
3. Notify Architect four calendar days in advance of scheduled meeting date.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Pre-blend tiles before palleting.

B. Deliver products to project site in manufacturer's unopened pallets, labeled with data indicating compliance with specified requirements.

C. Storage and Protection:
1. Store products of this section in manufacturer's unopened packaging until installation.
2. Maintain dry storage area for products of this section until installation of products.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 SEQUENCING

A. Ensure that installer of this section is in possession of roof tile manufacturer's complete installation

instructions before beginning construction activities of this section.

B. Maintain copy of manufacturer's complete installation instructions at project site.

1.11 WARRANTY

A. Special Warranty: The Contractor warrants products of this section, as installed, to be in accord with the Contract Documents and free from faults and defects in materials and workmanship for a period of 3 years after completion.

B. Manufacturer's Warranty: Furnish roof tile manufacturer's 50-year warranty against defects in product workmanship and materials.

1.12 EXTRA MATERIALS

A. Provide an additional 1 percent of installed roof tiles, but not less than one full square, for Owner's use in roof maintenance.

B. Furnish extra materials packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer of Concrete Roof Tile: Vande Hey Raleigh Roof Tile Manufacturing, 1nc., 1665 Bohm Drive, Little Chute, WI 54140-2529. ASD. Tel: (800) 236-8453 and (920) 766-0156. Fax: (920) 766-0776

B. Substitutions: In Accordance with Section 01600.

C. Supply all products specified in this section from same manufacturer as roof tile.

2.2 ROOF TILE

A. Basis of Design: Vande Hey Raleigh Spanish Tile; high barrel profile concrete tile with interlocking edges (Match Existing).
1. Size: 17-1/4 inches length by 13 inches width (match existing).
2. Exposure: Maximum 14 inches length by 12 inches width (match existing).
3. One 3/16 inch diameter factory-punched nailing hole (match existing).
4. Color: Selected from full range of manufacturer's available colors (match existing).

5. Glazed Coating: Supply tile with factory applied protective glazed coating.

B. Trim: Supply manufactured shapes of same material, style, color, and texture as roof tile for indicated hips, ridges, and rakes.

2.3 UNDERLAYMENTS

A. Two layers of No. 30 Asphalt Saturated Organic Felt as manufactured by Tamko Roofing Products, Joplin, MO, to meet requirements of ASTM D-226, Type 2 or equal.

B. Tri-flex 30 as manufactured by Flexia Corp., Ontario, Canada, to meet requirements of ICBO AC-48 or equal.

C. Duck's Back rubberized underlayment as manufactured by Cetco, Clinton, SC or equal.

D. VaproShield LLC Roof Shield underlayment (a breather membrane not requiring ventilation to the underside of the roof deck) as manufactured by The Proctor Group, Ltd., Forfer, Scotland.

E. Single Ply Roof Membrane System.

F. Self Seal Membrane that meets or exceeds requirements of ICBO AC-48 along roof perimeters and protrusions in severe weather areas: "StrongSeal Plus" as manufactured by Cetco, Clinton, SC or equal.

2.4 METAL FLASHINGS

A. General Requirements: Form flashings to profiles indicated on drawings, in accordance with manufacturer's printed instructions, and as recommended by SMACNA Architectural Sheet Metal Manual to protect materials from physical damage and to shed water.
   1. Form flashing lengths square, accurate to profile, in maximum possible lengths; form flashing lengths free from distortion or defects detrimental to appearance or performance.
   2. Hem edges of flashings exposed to view a minimum 1/4 inch on underside.

B. Eave Flashings and Other Metal Flashings: Copper sheet, ASTM B 370, cold rolled, natural finish; 16 ounces per square foot minimum thickness.

C. Eave Flashings and Other Metal Flashings: Copper sheet, ASTM B 370, cold rolled, natural finish; 20 ounces per square foot minimum thickness.

D. Eave Flashings and Other Metal Flashings: Stainless Steel Sheet for Flashings: ASTM A 666, Type 304 alloy, soft tempered; 24 gauge minimum thickness.

E. Eave Flashings and Other Metal Flashings: 24 gage galvanized steel sheet, ASTM A 653/A 653M, minimum G90/Z275 hot-dip zinc coating.

F. Eave Flashings: Aluminum sheet, ASTM B 209; 0.019 inch minimum thickness.

G. Concealed sealants along gable rakes, ridge/hip trim and flashings with asphalt saturated felt underlayment shall be non-running, heavy body #204 Plastic Roof Cement as manufactured by Henry Co., Huntington Park, CA, for Vande Hey Raleigh or equal to meet or exceed the requirements of ASTM D-2822-75 and Federal Specifications SS-S-153C (Type 1). Sealants used with EPDM, Duck's Back, StrongSeal Plus, Tri-Flex 30 or Daltex Roofshield Roof Underlayment shall be per manufacturer's recommendation.

H. Exposed sealants, such as those used on counter flashings or non-soldered joints, should be high quality such as Dymonic as manufactured by TREMCO, Beechwood, OH, or 3500 Roof Tile Adhesive/Sealant by Geocel, Elkhart, IN, to meet or exceed requirements of U.S. TT-S-00230C, U.S. Fed Cat. No 8030-965-2397, Canadian 19-GP-5M, ASTM C 290-79.

I. Mortar/Grout for hips (with Spanish tile), open valleys and saddles shall be a combination of 50 lbs of Quikwall Surface Bonding Cement #1220-#1231 and 120 lbs of Quikrete Mason Mix #1136 to meet or exceed strength requirements of ASTM C-387 for Type "N" mortar and Quikrete Concrete Acrylic Fortifier #8610 to meet or exceed ASTM C-887 standard specifications as manufactured by The Quikrete Companies, Atlanta, GA. Grout and colored oxide to match field tile available from the Manufacturer.

J. Adhesives to secure cut pieces of field tile along hips, valleys, flying gables, gables, sidewalls and protrusions and to install hip/ridge/rake trim shall be Titebond Heavy Duty Construction Adhesive as manufactured by Franklin International, Columbus, OH; Pro-Series RT-600 Roof Tile Adhesive as manufactured by OSI Sealants, Inc., Mentor, OH, or 3500 Roof Tile Adhesive/Sealant by Geocel,

Elkhart, IN.

2.5 ACCESSORY MATERIALS

A. Batten Strips: Softwood lumber preservative-treated under pressure; sized and located as specified.

B. Fasteners for Underlayment: 11 gauge, 3/8 inch diameter head by 7/8 inch long roofing nails of galvanized steel, copper or stainless steel.

C. Fasteners for field tile (Flat/Riviera): 11 gauge copper or stainless steel with 5/16 inch heads 1-3/4 inches long to penetrate 11/16 inch into batten strips.

D. Fasteners for field tile (Spanish): 10 gauge copper or stainless steel 3 inches long to penetrate 5/8 inch into batten strips.

E. Fasteners for Trim (Flat/Riviera): 10 gauge copper or stainless steel 2-1/2 inches long to penetrate into wood nailers.

F. Fasteners for Trim (Spanish): 10 gauge copper or stainless steel 3 inches long to penetrate into wood nailers.

G. Fasteners for Pans and Covers: Stainless steel, 1-3/4 inch thread point screws to penetrate into the cover nailer a minimum of 1 inch.

H. Fasteners for Battens: 5d nails of stainless steel or 16 gauge stainless steel staples of sufficient length to penetrate sheathing.

I. Fasteners for Metal Flashings: Ring-shank nails, 11 gage by 1 inch length, of same material as flashing metal (copper, stainless,, galvanized).

J. Hurricane Clips: Roof tile manufacturer's recommended clips; fabricated from copper sheet, 20 ounces per square foot. Provide at roofs of height exceeding 40 feet above grade or where high wind requirements are indicated.

K. Snow Guard: Roof tile manufacturer's fabricated unit for protection over entrances, lower roof areas, or other areas where falling snow is not desired; fabricated from copper sheet, 38 ounces per square foot.

L. Grout: A mix of equal parts of factory-mixed mortar meeting requirements of ASTM C 387, Type N, and factory-mixed surface bonding mortar meeting requirements of ASTM C 887.
   1. Add mineral oxide pigment made by roof tile manufacturer to match color of roof tile.
   2. Add water and acrylic additive in accordance with mortar materials manufacturers' instructions to obtain correct mix for workability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification roof deck structure meets roof tile manufacturer's installation requirements.
   1. Verify roof penetrations are in place and flashed to deck surface.
   2. Verify roof openings are correctly framed prior to installing Work of this section.
   3. Verify deck is of sufficient thickness to accept fasteners.
   4. Verify deck surfaces are dry, unfrozen, and free of ridges, warps, and voids

B. Installer's Examination: Examine condition of deck prior to installation. Notify Architect if conditions are unacceptable. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.2 PREPARATION

A. Broom clean deck surfaces prior to installation of underlayment.

B. Coordinate with installation of flashing, gutters, vents, skylights and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and securely fastened.

C. Arrange three or more stacks of roof tile at installation area; mix tile from stacks as installation progresses for consistent color blend. Do not overload roof surface with staged materials.

3.3 INSTALLATION

A. Install roof tile in accordance with shop drawings, manufacturer's printed installation instructions for specified project conditions, the NRCA Steep Slope Roofing Manual and SMACNA Architectural Sheet Metal Manual.

B. Verify that the eave fascia is installed as required for the specified roof tile.

C. Eave Flashings: Install metal eave flashing 1/8 inch beyond the fascia; lap end joints minimum 3 inches, with plastic cement seal between overlapping metal surfaces.
1. Apply self seal membrane over eave flashing parallel to eave edge in accordance with manufacturer's printed instructions.
2. Extend self seal membrane up roof slope minimum 2 feet beyond interior face of exterior wall or as required by code, whichever is greater.
3. Place each successive ply overlapping top edge of previous ply 3 inches.

D. Valley Flashings: Install 24 inch to 28 inch standing seam, double rib (for closed valleys) or 24 inch double rib valley flashing (for open grouted valleys).
1. Form flashings in accordance with manufacturer's instructions for valley type indicated.
2. Apply flashing over 36 inch full width vertical underlayment centered in all valley areas.
3. Install flashings centered on valley; nail in place at 12 inches on center, 1 inch from metal edges.
4. Roof Pitch 4 in 12 or Greater: Lap flashing end joints minimum 4 inches.
5. Roof Pitch Less Than 4 in 12: Lap flashing end joints minimum 6 inches.
6. For slopes below 3:12 in the sun belt or 4:12 in severe weather areas, install flashings and EPDM underlayment per details provided by the Manufacturer.

E. No.30 Underlayment: Install 2 plies underlayment over entire roof area, parallel to eaves.
1. Place first ply 18 inches wide at eave edge, with bottom edge extending 1/4 inch over lower edge of eave flashing; seal to eave flashing.
2. Place second ply 36 inches wide over first ply flush at bottom and sealed to first ply.
3. Place third ply 36 inches wide 15 inches up from bottom edge of first ply.
4. Place each successive ply 18 inches up from bottom of each previous ply.
5. Nail horizontal seams 1 inch from exposed edge of felt; space nails in accordance with manufacturer's printed instructions for roof slope.
6. Overlap vertical seams minimum 6 inches, seal lap with plastic cement, then nail at 3 inches on center; stagger vertical laps of each successive layer so that vertical joints do not align in any two adjacent plies.
7. Ridges, Except at Ridge Vents: Extend underlayment over ridges 6 inches on each side making a double layer.
8. Hips: Extend underlayment over hips 6 inches on each side making a double layer.
9. Valleys: Overlap metal valley flashing 3 inches and seal to metal.

F. Rubberized Underlayment and Asphalt Underlayment: Install underlayment over entire roof area,

parallel to eaves.

1. Install in accordance with manufacturer's printed instructions.
2. Place first ply at eave edge, with bottom edge extending 1/4 inch over lower edge of eave flashing; seal to eave flashing.
3. Place each successive ply overlapping top edge of previous ply 3 inches.
4. Ridges, Except at Ridge Vents: Extend underlayment over ridges 6 inches on each side making a double layer.
5. Hips: Extend underlayment over hips 6 inches on each side making a double layer.
6. Valleys: Overlap metal valley flashing 3 inches and seal to metal.

G. Single Ply Roof Membrane.

H. Intersections of Roof Surfaces and Abutting Vertical Surfaces:
1. Install continuous 36 inch wide strips of self seal membrane to extend 30 inches across roof deck and 6 inches up vertical surface.
2. Install continuous metal flashing to extend 3 inches up vertical surface.
3. At locations where vertical surface will abut top edge of tile, install metal flashing to extend 3 inches up vertical surface, form metal flashing to extend minimum 3 inches over tile, and form 1/2 inch return hem at edge of metal.
4. Form saddle flashings for protrusions through roof in accordance with manufacturer's printed instructions.

I. Ridge Vent: Install in accordance with manufacturer's printed instructions.

J. Vertical Battens for Very Low Slope Installation With Flat Roof Membrane System:
1. Install 1 inch by 3 inches, nominal, battens vertically at 24 inches on center.
2. See manufacturer's specifications for complete installation of flat roof membrane system.
3. Install pressure treated 1 inch by 4 inches, nominal, horizontal battens over roof membrane as specified for required tile type.

K. Battens for Spanish Tile Installation: Pressure treated, notched 1 inch by 2 inches, nominal.
1. Install ridge batten with top edge approximately 1 inch from ridge nailer or vent.
2. Strike horizontal line for top edge of first batten 15 inches up roof slope, and parallel to, eave edge.
3. Strike intermediate horizontal lines between line for top edge of first batten and top edge of ridge batten; space lines equally, at maximum spacing of 14 inches.
4. Install battens with top edges aligned with struck lines; nail battens to roof deck at 6 inches on center, maximum.

L. Battens for Riviera Tile Installation: Pressure treated, notched 1 inch by 2 inches, nominal.
1. Install ridge batten with top edge approximately 1 inch from ridge nailer or vent.
2. Strike horizontal line for top edge of first batten 12-3/4 inches up roof slope, and parallel to, eave edge.
3. Strike intermediate horizontal lines between line for top edge of first batten and top edge of ridge batten; space lines equally, at maximum spacing of 12 inches.
4. Install battens with top edges aligned with struck lines; nail battens to roof deck at 6 inches on center, maximum.

M. Battens for Flat Tile Installation: Pressure treated, notched 1 inch by 2 inches, nominal.
1. Install ridge batten with top edge approximately 1 inch from ridge nailer or vent.
2. Strike horizontal line for top edge of first batten strip 13-1/4 inches up roof slope, and parallel to, eave edge.
3. Strike intermediate horizontal lines between line for top edge of first batten and top edge of ridge batten; space lines equally, at maximum spacing of 12 inches.
4. Install battens with top edges aligned with struck lines; nail battens to roof deck at 6 inches on center, maximum.

N. Roof Tile:
1. Riviera Tile: Install tile left to right, as viewed facing ridge.
2. Spanish Tile and Flat Tile: Install tile right to left, as viewed facing ridge.
3. Riviera Tile and Spanish Tile: Install closure strips in accordance with manufacturer's printed instructions for project conditions.
4. Fasten tile to battens in accordance with manufacturer's recommended nailing schedule for tile type, roof slope, and wind and height conditions.
5. Cut tile, as tile installation progresses, for hip, valley, and wall conditions.

O. Install venting as tile installation progresses; locate in accordance with manufacturer's instructions.

P. Trim:
1. Install trim pieces for hips, ridges, and rakes as tile installation progresses; cut shapes, set in bed of plastic roof cement, and secure in place with minimum 2 fasteners per piece for rake trim, and minimum 1 fastener per piece for hip and ridge trim.
2. Cut special shapes for project conditions as required.
3. Overlap trim piece ends minimum 3 inches; seal overlapping surfaces with plastic roof cement.

Q. Counterflashings:
1. Install counterflashings tight to substrates, with top edge of counterflashing concealing base flashings; lap end joints minimum 3 inches.
2. Fasten counterflashings using specified fasteners; fasten on vertical surfaces only, at maximum spacing 12 inches on center.

3.4 PROTECTION

A. Protect installed work until project completion.

B. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07535 - FULLY ADHERED MULTI-PLY ROOF SYSTEM

PART 1 - GENERAL

1.00 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.01 AREAS COVERED

A. Low slope roof area at new addition.

1.02 INSTALLER QUALIFICATIONS

A. Roofing Installer must be:
   1. Currently prequalified with the Owner in accordance with Owner's prequalification requirements.
   2. Currently in good standing with the manufacturer.

B. It shall remain each Contractor's responsibility to determine his current status with the manufacturer's certification plan.

1.03 QUALITY ASSURANCE

A. Applicator/Installer:
   1. Acceptable to roof material manufacturer for the manufacturer's warranty requirements.
   2. Five (5) years successful experience on projects similar in size and scope.
   3. Experienced in the type of roofing work required.
   4. Successfully completed previous projects warranted by the manufacturer.

B. Manufacturer’s Observation Reports: Beginning with the commencement of the roofing system installation for the project and continuing through the completion of the roofing system installation and all its associated components, the Roofing System Manufacturer or their appointed representative will provide written observation reports including digital photos as follows and this shall be confirmed in writing by the manufacturer and made part of the roofing submittals.
   1. Keep the Architect / Owner informed as to the progress, status, and quality of work as observed.
   2. Provide jobsite observations no less than (2) hours per week throughout the installation of the roofing system and its associated components. Reports shall include detailed weekly reports to the Architect, Contractor, and Subcontractor along with digital photographs of work in progress. These reports and photographs shall be descriptive of actual work in progress, status, and condition, and be presented in a written format with digital color photographs.
   3. Report to the Architect / Owner in writing any refusal or failure of the Contractor to correct unacceptable practices or conditions called to the Contractor’s attention.

4. Confirming, after completion of the project and based on manufacturer's observations and tests (if necessary), that manufacturer has observed no deviations from application procedures in conflict with the plans and specifications or the manufacturer's installation requirements for warranty other than those that may have been previously reported or approved.
5. The roof system manufacturer shall, at the Owners request, perform an annual inspection of the roof system each year for the term of the warranty at no additional cost to the owner. These observations shall include a written report with photographs for presentation to the Owner. Inspections are to be scheduled and coordinated by the Owner and performed by the manufacturer's representative. Nothing shall be required of the Owner other than providing access to the roof system.
6. It will be the sole responsibility of each bidder to ensure these conditions are to be met by the roofing system manufacturer or their appointed representative prior to bidding.

1.04 MANUFACTURER QUALIFICATIONS

A. A qualified manufacturer that has been UL Listed and has FM Approvals for membrane roofing system similar to that used in this project for a minimum of fifteen (15) years.

B. The roofing membrane manufacturer is defined as a company which makes the primary roofing membrane and flashing membrane in its own factories from, rawer states of material. No "Private Label" roofing membrane or flashing membrane material (in which one company's name goes on a product manufactured by others) is acceptable for this project.

C. Testing Laboratory Services: Test results shall meet or exceed established standards.

D. Underwriters Laboratory (Roofing Covering): Class A fire hazard classification.

E. Comply with governing local, state, and federal regulations, safety standards, and codes.

1.05 REFERENCES (INCLUDING LATEST REVISIONS)

A. American Society for Testing and Materials:

1.	ASTM B 209	Specification for Aluminum and Aluminum Alloy Sheet and Plate
2.	ASTM C 719	Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cycle Movement (Hockman Cycle)
3.	ASTM C 794	Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
4.	ASTM C 920	Specification for Elastomeric Joint Sealants
5.	ASTM D 312	Specification for Asphalt Used in Roofing
6.	ASTM D 1863	Specification for Mineral Aggregate Used on Built-up Roofs
7.	ASTM D 2178	Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
8.	ASTM D 2824	Specification for Aluminum - Pigmented Asphalt Roof Coatings
9.	ASTM D 4586	Specification for Asphalt Roof Cement, Asbestos Free
10.	ASTM A 361	Sheet Steel, Zinc-Coated (Galv.) by the Hot-Dip Process for Roofing and Siding
11.	ASTM C 177	Test for Thermal Laboratory Services
12.	ASTM C 728	Perlite Thermal Insulation Board

B. Federal Specifications:
1. LLL-I-535B
2. SS-A-701B
3. SS-C-153
4. SS-C-153C
5. SS-R-620B
6. TT-C-498C
7. TT-P-320D

8. TT-S-00227E
9. TT-S-00230C
10. SS-S-001534 (GSA-FSS)
11. L-P-375

C. Industry Standards:
1. The National Roofing Contractors Association (NRCA) - Roofing and Waterproofing Manual
2. Single-ply Roofing Institute (SPRI) - A Professional Guide to Specifications Manual
3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) - Architectural Sheet Metal Manual
4. American Society of Civil Engineers – ASCE 7

1.05 SUBMITTALS

A. Samples and Manufacturer's Submittals: Submit prior to delivery or installation.
1. Samples of all roofing system components including all specified accessories.
2. Submit samples of proposed warranty complete with any addenda necessary to meet the warranty requirements as specified.
3. Submit latest edition of manufacturer's specifications and installation procedures. Submit only those items applicable to this project.
4. A written statement from the roofing materials manufacturer approving the installer, specifications and drawings as described and/or shown for this project and stating the intent to guarantee the completed project.
5. Manufacturer's Equiviscous Temperatures (EVT) for the specified bitumens.

B. Shop Drawings: Provide manufacturer's approved job specific details of all perimeter conditions, projection conditions, and any additional special job conditions which require details other than indicated in the drawings.

C. Maintenance Procedures: Within ten days of the date of Substantial Completion of the project, deliver to the Owner three copies of the manufacturer's printed instructions regarding care and maintenance of the roof.

D. Written confirmation from manufacturer’s stating conformance to quality assurance as listed above in Section 1.03, Quality Assurance, Item B, Nos. 1 thru 6.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers and rolls with all labels intact and legible including labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

B. Deliver materials requiring fire resistance classification to the job with labels attached and packaged as required by labeling service.

C. Deliver materials in sufficient quantity to allow continuity of work.

D. Handle and store material and equipment in such a manner as to avoid damage. Liquid products shall be delivered sealed, in original containers.

E. Handle rolled goods so as to prevent damage to edge or ends.

F. Select and operate material handling equipment so as not to damage existing construction or applied roofing.

G. Moisture-sensitive products shall be maintained in dry storage areas and properly covered. Provide continuous protection of materials against wetting and moisture absorption. Store roofing and flashing materials on clean raised platforms with weather protective covering when stored outdoors.

H. Store rolled goods on end.

I. Protect materials against damage by construction traffic.

J. The proper storage of materials is the sole responsibility of the contractor and any wet or damaged roofing materials shall be discarded, removed from the project site, and replaced prior to application.

K. Comply with fire and safety regulations, especially with materials which are extremely flammable and/or toxic. Use safety precautions indicated on labels.

L. Products liable, such as emulsions, to degrade as a result of being frozen shall be maintained above 40° F in heated storage.

M. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day.

1.07 SITE CONDITIONS

A. Job Condition Requirements:
1. Apply roofing in dry weather.
2. Do not apply roofing when ambient temperature is below 40° F.
3. Coordinate the work of the contractor with the work to be performed by the Owner's personnel, to ensure proper sequencing of the entire work. The Owner's personnel will be erecting interior protection for equipment, if required. The contractor is to schedule his work so that adequate time is allowed for the Owner’s personnel to perform the work. No roof work shall be performed until the Owner’s personnel have completed erection of the interior protection in that area.
4. Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with specifications.
5. Schedule the work so the building will be left watertight at the end of each day. Do not remove more roofing material than can be reinstalled in any working day.
6. All surfaces to receive new roofing shall be smooth, dry, and free from dirt, debris, and foreign material before any of this work is installed. Competent operators shall be in attendance at all times equipment is in use. Materials shall be stored neatly in areas designated by the Owner. Load placed on the roof at any point shall not exceed the safe load for which the roof is designed.
7. The contractor shall take all necessary precautions to protect the roof mat and deck from damage. The contractor shall be responsible for repairing all new areas of damage caused by the negligence of the contractor, at the contractor's expense. The Owner's on-site representative shall determine damage caused by contractor negligence.
8. The contractor shall follow local, state, and federal regulations, safety standards, and codes for the removal, handling, and disposal of asbestos containing materials, if present. When a conflict exists, use the stricter document.
9. Follow insurance underwriter's requirements acceptable for use with specified products or systems.
10. Due caution should be exercised so as not to alter the structural integrity of the deck. When cutting through any deck, care should be taken so as not to damage the deck or any part of the deck, such as post tension cables, etc.
11. All kettles shall have an automatic thermostat control, and temperature gauge, all in working order.

12. The contractor is to verify the location of all interior ducts, electrical lines, piping, conduit, and/or similar obstructions. The contractor is to perform all work in such a manner as to avoid contact with the above mentioned items.
13. Surface and air temperatures should be a minimum 45° F during applications of cleaner and waterproof coating and remain above 45° F for a minimum of four (4) hours following applications. Verify compatibility of cleaner with coatings, paints, primers and joint sealers specified. Advise Owner's representative of any problems in this regard prior to commencing cleaning operations.
14. Temporary Sanitary Facilities: The contractor shall furnish and maintain temporary sanitary facilities for employees use during this project. These will be removed after the completion of the project. All portable facilities shall comply with local laws, codes, and regulations.

B. Protection of Work and Property:
1. Work: The contractor shall maintain adequate protection of all his work from damage and shall protect the Owner's and adjacent property from injury or loss arising from this contract. He shall provide and maintain at all times any OSHA required danger signs, guards, and/or obstructions necessary to protect the public and his workmen from any dangers inherent with or created by the work in progress. All federal, state, and city rules and requirements pertaining to safety and all EPA standards, OSHA standards, NESHAP regulations pertaining to asbestos as required shall be fulfilled by the contractor as part of his proposal.
2. Property: Protect existing planting and landscaping as necessary or required to provide and maintain clearance and access to the work of this contract. Examples of two categories or degrees of protection are generally as follows: a) removal, protection, preservation, or replacement and replanting of plant materials; b) protection of plant materials in place, and replacement of any damage resulting from the contractor's operations.
3. Twenty-four Hour Call: The contractor shall have personnel on call 24 hours per day, seven (7) days per week for emergencies during the course of a job. The Owner's Project Manager is to have the 24 hour numbers for the contact. Contractor must be able to respond to any emergency call and have personnel on-site within two (2) hours after contact. Numbers available to the Owner's Project Manager are to be both home and office numbers for:
   a) Job Foreman
   b) Job Superintendent
   c) Owner or Company Officer

C. Damage to Work of Others: The contractor shall repair, refinish, and make good any damage to the building or landscaping resulting from any of his operation. This shall include, but is not limited to, any damage to plaster, tile work, wall covering, paint, ceilings, floors, or any other finished work. Damage done to the building, equipment, or grounds must be repaired at the successful contractor's expense holding the Owner harmless from any other claims for property damage and/or personal injury.

D. Measurements: It will be the contractor's responsibility to obtain and/or verify any necessary dimensions by visiting the job site, and the contractor shall be responsible for the correctness of same. Any drawings supplied are for reference only.

E. Use of Premises:
1. The contractor is advised that the Owner will occupy the building at all times, and the contractor must provide all safeguards required to protect personnel and to keep noise levels as low as reasonably possible for each operation.
2. The contractor shall:
   a) Coordinate work in such a manner as to not interfere with the normal operation of the building.
   b) Assume full responsibility for protection and safekeeping of products stored on premises.
   c) Agree to hold the Owner harmless in any and all liability of every nature and description which may be suffered through bodily injuries, including death of any persons by reason of negligence of the contractor, agents, employees, or subcontractors.

F. Cleaning and Disposal of Materials:
1. Contractor shall keep the job clean and free from all loose materials and foreign matter. Contractor shall take necessary precautions to keep outside walls clean and shall allow no roofing materials to remain on the outside walls.
2. All waste materials, rubbish, etc., shall be removed from the Owner's premises as accumulated. Rubbish shall be carefully handled to reduce the spread of dust. A suitable scrap chute or hoist must be used to lower any debris. At completion, all work areas shall be left broom clean and all contractor's equipment and materials removed from the site.
3. All bituminous or roofing related materials shall be removed from ladders, stairs, railings, and similar parts of the building.
4. Debris shall be deposited at an approved disposal site.

1.08 WARRANTY

A. Twenty (20) Year NDL with no exclusion for 2" hail occurrence Warranty: The complete roofing system shall be guaranteed for a minimum of twenty (20) years from the date of Substantial Completion for this project. Guarantee responsibilities shall be as follows:
1. Roofing contractor shall guarantee the entire roofing system for a period of two (2) years from the date of Substantial Completion.
2. The materials manufacturer shall guarantee the entire roofing system as supplied by system manufacturer for a total period of twenty (20) years from the date of substantial completion.
3. Membrane manufacturer shall provide the written warranty as specified.
4. The entire roofing system shall be guaranteed to be watertight and against any failures of workmanship and materials. Repair of the system, including materials and labor, shall be done at no cost to the Owner.
5. Warranty repairs shall be performed by a certified installer. The repairs shall be performed in accordance with the manufacturer's written instructions and recommended procedures so as to not void the warranty.

B. During the proposal period each Contractor shall make arrangements with the materials manufacturer to provide the required warranty. Refer to SUBMITTALS paragraph in this section for requirements concerning submittals of warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Compatibility: Provide materials that are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

B. Materials herein specified shall be supplied or approved in writing by the manufacturer issuing the warranty pre-approved or approved equal.

C. The white polyester reinforced fleece backed adhered Elvaloy® roofing system shall only be applied by manufacturer approved and trained roofing contractors.

D. The manufacturer shall have 15 years UL listing for the membrane to be used on the project. Membrane manufacturer shall have a minimum of 15 years FM approval, and 15 years manufacturing experience with the roofing membrane specified for this project.

E. All roofing and roof accessories shall be installed in compliance with manufacturer's current specifications and details.

F. All materials used on the project shall be asbestos free.

2.02 ROOFING MEMBRANE

A. The white 67 mil polyester reinforced fleece backed Elvaloy® membrane shall have the following minimum physical properties.

Property	Test Procedure	Physical Properties
Color		White
Thickness	ASTM D 751	67 mil Nominal
Roll Size		76" x 90’
Breaking Strength	ASTM D 751	325 x 324 lbf
Tear Strength	ASTM D 751	89 x 109 lbf
Seam Strength	ASTM D 751	295 lbf
Elongation	ASTM D 751	50% x 42%
Heat Aging	ASTM D 3045	>90 %
Low Temp Bend	ASTM D 2136	Pass (-40° F)
Static Puncture Resistance	ASTM D 5602	Pass
Dynamic Puncture Resistance	ASTM D 5635	Pass
Permeance	ASTM E 96	0.003 Perms
Dimensional Stability	ASTM D 1204	0.3%
Weight Change after Water Immersion	ASTM D 570	1.20%
Accelerated Weathering	ASTM G 155	Pass
Fungi Resistance	ASTM G 21	No growth
Solar Reflectivity	ASTM C 1549	0.82 (white)
Emissivity	ASTM C 1371	0.91 (white)
Solar Reflectance Index (SRI)	ASTM E 1980	109 (white)
Underwriters Laboratory	Class A	Approved
Factory Mutual	Class 1-90	Exceeds
Thermoplastic Membrane	ASTM D 4434	Exceeds
Factory Mutual	Class 1-90	Exceeds
Thermoplastic Membrane	ASTM D 4434	Exceeds

2.03 FLASHING MEMBRANE

A. The flashing membrane shall be a white Elvaloy® polyester reinforced flexible sheet.

Property	Test Procedure	Physical Properties
Color		White
Thickness	ASTM D 751	60 mil Nominal
Breaking Strength	ASTM D 751	298 x 278 lbf
Seam Strength	ASTM D 751	286 lbf
Tear Strength	ASTM D751	89 x 109 lbf
Elongation	ASTM D 751	35% x 34%
Heat Aging	ASTM D 3045	>90%
Static Puncture Resistance	ASTM D 5602	Pass
Dynamic Puncture Resistance	ASTM D 5635	Pass
Low Temperature Bend	ASTM D 2136	Pass @ -40°F
Permeance	ASTM E 96	0.003 Perms
Dimensional Stability	ASTM D 1204	0.3%
Wt. Change after Immersion	ASTM D 570	1.20%
Accelerated Weathering	ASTM G 155	Pass
Fungi Resistance	ASTM G 21	Pass
Solar Reflectivity	ASTM C 1549	0.82
Solar Emissivity	ASTM C 1371	0.91
Solar Reflectance Index (SRI)	ASTM E 1980	109

Underwriters Laboratory	Class A
Factory Mutual	Class 1-90

2.04 NON-REINFORCED MEMBRANE

A. The non-reinforced membrane shall have the following minimum properties.
1. Description: Non-reinforced thermoplastic white membrane, thickness approximately 45 mils.
2. Use: Inside/outside corners, multiangled intersections, sealant pockets and other conditions where molding of the membrane is required.

2.05 BITUMEN

A. Shall be ASTM D 312 Type IV steep asphalt.

Slope	Interply	Cap Ply	Backnail	Strap
0 - ½" per 12"	Type IV	Type IV	No	No
½" - 2" per 12"	Type IV	Type IV	Yes	Strap if Possible
2" - 3" per 12"	Type IV	Type IV	Yes	Yes

2.06 CAULKS

A. Sealant for use at coping joints, reglet joints, etc., shall be a one-component urethane non-sag, gun grade sealant designed for use in active exterior joints, and shall meet or exceed Federal Specification No. 1 TT-S-00230C, Type II, Class A, ASTM C 920. Where joint surfaces are contained or are contaminated with bituminous materials, provide manufacturer's modified-type sealant (modified with coal-tar or asphalt as required), or approved equal.

B. To seal the leading edge of the membrane, to bond membrane at terminations with metal, and for open seam repair, sealant shall be a thermosetting, solvent free, non-slump, self-fixturing, multipurpose structural sealant which shall meet the following physical and performance properties, M-1 as manufactured by Chem Link Inc., or approved equal.

Properties	
Specific Gravity	1.62 (13.5 lbs./gallon)
Viscosity	800,000 cps Brookfield RTV, TF spindle, 4 rpm 70° F.
Shear Strength (ASTM D-1002)	300 psi+ (7 day ambient cure)
Elongation @ break (ASTM D-412)	300% (7 day ambient cure)
Hardness Shore A (ASTM C-661)	50 – 55 (14 day ambient cure)
Tack free time (ASTM C-679)	35 minutes
Low temperature flex	Minus 20° F: PASS
Slump (sag) (ASTM C-639)	Zero slump
Shrinkage (ASTM D-2453)	No measurable shrinkage (14 cay cure)
Service temperature	-40° F to 200° F

2.07 UNDERLAYMENT PLIES

A. Shall be Underwriters Laboratory approved and listed in the FM Global Approval Guide.

B. Shall be SBS 80 mil SS base sheet, tested in accordance with ASTM D 5147, as approved by field membrane manufacturer, or approved equal.

2.08 INSULATION

A. All insulation shall be approved in writing by the membrane manufacturer as to thickness, type, and manufacturer. All insulation must be approved for the specific application, Underwriters Laboratory approved, and be listed in the FM Global Approval Guide.

B. Polyisocyanurate Roof Insulation: Insulation shall be rigid polyisocyanurate foam board; thickness and LTTR-value shall be a minimum of 3.5" = 21.7; meeting Federal Specification No. HH-I-1972/1 or 2 with 20 psi minimum compressive strength and 2.0 pcf minimum density. Board shall be surfaced on two (2) sides with non-asphaltic facer material.

C. Recovery Board: Impact-resistant, nonstructural, specially engineered gypsum and cellulose fiber panels with 95% recycled content; uniform water-resistance throughout core and surface. Board size four feet by eight feet (4' x 8'), thickness 1/2"; conforming to ASTM C 1278, meeting FM 4470 Class 1 criteria, classified by Underwriters Laboratory, and listed in the FM Global Approval Guide. Board will meet the following physical properties, Securock™ Roof Board, as manufactured by USG Corporation, or approved equal.

Test	Typical Value	Test Method
Fire Resistance	Class A	UL 790
Permeance	≤ 30	ASTM C473
Surface water absorption	≤ 1.6 nominal grams	ASTM C473
Water resistance	Maximum 10% weight percentage gain	
Mold Resistance	Minimum rating of "10"	ASTM D3273

2.09 FASTENERS AND PLATES

A. General: All fasteners and plates for the installation of insulation, and for the installation of the membrane, shall be supplied and warranted by the membrane manufacturer for the specific application.

B. Membrane attachment toggles, if required, shall be provided and warranted by the membrane manufacturer.

C. All fasteners and plates shall be FM Global approved corrosion resistant screws or anchors supplied and warranted by the membrane manufacturer. Fasteners shall be of a type and length recommended by the manufacturer for fastening the insulation and/or protection layer (through the existing roof in reroofing) to the structural roof deck.

2.10 FASTENERS

A. Fasteners and fastening plates or bars shall be listed in the FM Global Approval Guide, and be as recommended by the fastener manufacturer for the specific application.

B. Fastener for Brick: Shall be one-fourth inch by two inches (1/4" x 2"), zinc with plated steel or stainless steel nail, one piece unit, flat head, as manufactured by Rawl Zamac Nailin, or approved equal.

C. Fastener for Steel Deck: Shall be a minimum #14 fastener, fluorocarbon coated, with CR-10 coating. A minimum .200 diameter shank and .250 diameter thread. To be used with round pressure plates or bar, and having a fluorocarbon CR-10 coating, when subjected to thirty (30) Kesternich cycles (DIN 50018) shows less than ten percent (10%) red rust which surpasses FM Global Approval Standard 4470, as manufactured by Olympic Manufacturing Group, Inc., or approved equal. Fasteners, plates, and/or bars shall be listed in the FM Global Approval Guide.

2.11 BONDING ADHESIVE FOR FLASHING

A. Description: Adhesive is a bonding cement of synthetic rubber for fully adhering membranes to various substrates, produced by Ashland Chemical, or approved equal.

Typical Liquid Properties (Room Temperature)	
Color	Amber/Yellow
Base Product	Neoprene
Solids	25%
Specific Gravity	.87
Pounds/Gallon	7.25
Viscosity (CPS)	2500
Solvents	Ketone, Toluene, Aliphatic Hydrocarbon, Zylene
Estimated Coverage	
2 Sided Application	55/70 sq. ft. (2/2.5 mils dry)
DOT Label Required	Flammable Liquid
Code - 584661	

B. Handling: Contains ingredients which could be harmful if mishandled. Contact with skin and eyes should be avoided and necessary protective equipment and clothing should be worn.

2.12 ASPHALT ROOF PRIMER

A. Quick-dry asphalt-based primer for priming of asphalt roof surfaces.

Applicable Federal Specification	SS-A-701B
ASTM	D 41
Flash Point	105° F
Viscosity at 80° F (ASTM D 217)	50-60 K.U.
Weight per gallon	7.4 pounds
Drying time (to touch)	Min. 4 hours

2.13 CANT STRIP

A. Shall be wood fiber where used for non-structural purposes. Shall be treated solid wood where used for structural purposes meeting NRCA, FM Global and Underwriters Laboratory guidelines. If solid wood cant is used where insulation exists, cant is to be toe nailed into treated solid wood nailer the same height as insulation.

2.14 WOOD

A. All nailers, cants and wooden curbs shall be fire rated, treated lumber as required by NRCA, FM Global and Underwriters Laboratory guidelines.

2.15 TRIM STRIP

A. The trim strip shall have the following minimum properties.

1. Six inch (6") wide non-reinforced 45 mil thermoplastic used for capping butted ends of rolls.
2. The trim strip is seamed with the use of hot-air welding.

2.16 CORNERS

A. Inside and outside corners shall be supplied by the membrane manufacturer and shall be of the same base material as the roof membrane.

2.17 PIPE BANDS

A. Stainless steel bands with self-locking heads.

B. Tighten with hand tool for tension control and flush cut off.

2.18 PRE-MOLDED BOOTS

A. Non-reinforced thermoplastic tapered molds for various pipes, heat welded to field membrane and sealed at top with stainless steel pipe bands and seam sealer.

2.19 PITCH PAN SEALANT

A. Shall be one-part, self-leveling polyurethane sealant meeting Federal Specification No. TT-S-00230C, Type I, Class A, ASTM C 920, Type S, Grade P, Class 25, for use in new pitch pans.

2.20 PIPESTANDS (6" OR SMALLER - LESS THAN 9" OFF ROOF SURFACE)

A. Black, polycarbonate construction with stainless steel roller pin assembly suitable for gas lines and conduit set in finished roof assemblies, Model No. 24R, sized accordingly, as manufactured by Miro Industries, Inc.

2.21 WALKWAY PAD

A. The walkway pad shall have the following minimum physical properties, and be applied with edges heat or solvent welded.

Property	Test Procedure	Physical Properties
Color		Gray
Size		36" wide x 60' long
Thickness	ASTM D 638	.080" nominal
Reinforcement		1000 Denier Polyester
Tear Strength	ASTM D 751	210 X 200 lbf
Puncture Resistance		96 lbs
Cold Resistance	ASTM D 1043	-40° C
Shore A Durometer		85
Hydrostatic Resistance		400 psi
Dimensional Stability	ASTM D 1240	≤ 1%
Ultraviolet Stability		12,000 hrs. Excellent

2.22 TERMINATION/PRESSURE BARS

A. Aluminum strip shall be extruded channel bar with a mill finish, width one inch (1"), thickness 0.100" ± .008", leg height one-fourth inch (1/4") top and bottom, leg angle ninety degrees (90°), for perimeter and curb anchorage, having predrilled holes six inches (6") on center, as manufactured by Olympic Fasteners, or approved equal.

2.23 T- JOINT COVERS

A. Supplied by the membrane manufacturer as a secondary covering to all T – Joints in the installation of thermoplastic roof systems consisting of waterproofing coverings equal to or greater than 60 mils in thickness.

2.24 VERTICAL WALL SHIMMING MATERIAL

A. Shall be one of the following unless otherwise accepted by Owner's representative: OSB, exterior grade plywood, gypsum core board or concrete core board. Proper selection of material is required to achieve FM Global and UL guidelines.

2.25 SELF-ADHERING UNDERLAYMENT FOR TEMPORARY WATERPROOFING

A. A premium heavyweight, minimum 60 mil, self-adhering underlayment, to use as a temporary waterproofing barrier.

2.26 OVERNIGHT SEAL

A. Hot applied asphalt bitumen shall be provided for the purpose of night sealing the roof system.

2.27 DELIVERY AND STORAGE

A. All materials shall be delivered with appropriate carton and can labels indicating appropriate warnings, storage conditions, lot numbers, and usage instructions. Materials damaged in shipping or storage shall not be used.

2.28 PRECAUTIONS

A. Some of the indicated materials are extremely flammable and/or toxic. Use precautions indicated on can and carton labels.

2.29 MISCELLANEOUS MATERIALS

A. Other materials shall be as specified or of the best grade for the proposed use as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 REFERENCE

A. The manufacturer's Technical Specifications shall be considered a part of this specification and should be referred to for more specific application procedures and recommendations.

B. Application of materials shall be in strict accordance with the manufacturer's recommendations except where more stringent requirements are shown or specified. In the instance of a conflict between these specifications and those of the manufacturer, the more stringent specifications shall take precedence.

C. General Installation:
1. Protect adjacent areas with tarpaulin or other durable materials.
2. Contractor shall prevent overspray, and be responsible for parking lot areas and/or adjoining areas not part of this contract.
3. Contractor shall be responsible for sealing, as required, all openings that may allow bitumen migration or drippage, i.e. pitch dams, envelopes, and filler strips.
4. Prepare surfaces according to manufacturer's or applicator's published instructions. All metal that is to receive bitumen, or come in contact with bitumen or adhesive, shall be first primed with appropriate primer. Any prefinished sheet steel that is to receive bitumen, or come in contact with bitumen or adhesive, shall be scored, scuffed or abraded prior to receiving primer.
5. Use cleaning materials or primers necessary to render an acceptable surface/substrate.
6. All surfaces/substrates shall be clean and dry prior to application of materials.

7. Prior to application of felts and membrane, all foreign matter, gravel, etc., shall be removed from the insulation and/or substrate. Gravel or debris between the insulation/substrate and plies is not acceptable.
8. Bitumen kettle shall have a visible thermometer and thermostatic control or some other means to provide positive monitoring of the bitumen temperature when it is heated in accordance with manufacturer's instructions.
9. Ambient temperature shall be 45° F and rising.
10. The maximum heating temperature of Type III asphalt shall be 500° F.
11. The temperature of Type III asphalt shall be approximately 430° F ± at the point of application or as recommended by the membrane manufacturer.
12. Maintain kettle and/or tanker temperature at least 25° F below the actual flash point of the bituminous materials used.
13. Never heat the bituminous materials at high temperatures for prolonged periods of time.
14. Do not allow bituminous materials to stand in luggers for long periods.
15. Circulate bituminous materials.
16. Insulate hot transport lines if required.
17. Wrinkles, buckles, kinks, and fishmouths are not acceptable when laying membrane.
18. Where deteriorated base flashing is removed, primed cant strips shall be installed at the intersection of the deck and the vertical surfaces. All flashings shall be mechanically top-fastened with a termination bar a minimum of six inches (6") on center at the top leading edge, and be a minimum of eight inches (8") in height from finished membrane.
19. Provide a water test of each roof section prior to substantial completion. The test should simulate rainfall of one inch (1") per hour minimum.
20. On slopes greater than one inch (1") in twelve inches (12"), refer to NRCA and/or manufacturer's guidelines for backnailing procedures and follow the more stringent guidelines for all specified materials.

3.02 SUBSTRATE PREPARATION

A. New Construction: Substrate shall be smooth and free of debris, sharp edges, and other surface irregularities prior to work starting. Substrate repair shall be performed as required to minimum of NRCA standards.

B. Metal Decks – New Construction:
1. All loose rust, bitumen, or other foreign material shall be removed from the deck before applying asphalt primer at the minimal rate of one and one-half (1-1/2) gallons per one hundred (100) square feet of area.
2. The deck span shall not exceed that recommended by FM Global Bulletin 1-28.
3. Expansion/control joints shall be installed so that no one area exceeds two hundred feet by two hundred feet (200' x 200').

3.03 MECHANICALLY FASTENED INSULATION

A. Specified insulation shall be mechanically fastened to conform to the ASCE 7 criteria for wind uplift as dictated by wind zone applicable to location of project. Fasteners and fastening patterns shall be determined by building height, location and geographical area of the United States. It is the contractor's responsibility to consult current publications, literature, and bulletins of IBC and the manufacturer that are in effect at the time of this project. Boards shall be staggered and butted as close as possible with voids over one-fourth inch (1/4") to be filled.

B. Insulation shall be loose laid with edges parallel to flutes and bearing on deck surface/flats. Insulation shall be laid in two layers, totaling the specified thickness and R-value so that each layer breaks joints to a minimum of six inches (6") both ways with the preceding layer, The long dimension of base insulation layer must be fully supported by the top flange of the metal deck. The edges of insulation boards must not cantilever over the flutes of the metal deck.

C. The top surface of the insulation shall be covered with the specified cover board so that each layer breaks joints to a minimum of six inches (6") both ways with the preceding layer, and mechanically fastened thru all layers of the insulation board and into the metal deck to conform to the ASCE 7 criteria for wind uplift as dictated by wind zone applicable to location of project

3.04 NAILERS

A. Wooden nailers shall be installed at gravel stops, drip edges, and expansion joints on outside perimeter of building according to NRCA, Underwriters Laboratory and IBC guidelines.

B. All Construction: Nailers shall be the same height as the new recovery board being installed where required. Nailers shall be raised if necessary by anchoring an additional nailer of appropriate height to the existing nailer if the existing nailer is not to be replaced. Nailers shall be anchored to resist a pull-out force of one hundred seventy-five pounds (175#) per foot. Fasteners shall be no less than two (2) per nailer, and be spaced at three feet (3') on center maximum. Expansion joint nailers shall extend upward a minimum of eight inches (8") above finish roof height.

3.05 WOOD CANTS

A. Toe of cant shall be level with the surface to receive new roof membrane and in all cases anchored according to NRCA, Underwriters Laboratory and IBC guidelines.

3.06 APPLICATION OF BASE SHEET

A. Cover Board shall be covered with SBS 80 mil SS base sheet fully adhered as follows:
Base sheet shall be solid mopped at the nominal rate of thirty pounds (30#) ± 20 percent per one hundred (100) square feet using asphalt Type IV as required by slope, properly heated. Specified layers shall be applied in accordance with the manufacturer's recommendations and in accordance with general practices as set forth by the NRCA Roofing Manual.
1. (Note: If base sheet are to be left exposed to the elements for more than 30 days,the top ply must be glazed coated with a solid mopping of Type IV asphalt at the nominal rate of thirty pounds (30#) per one hundred (100) square feet.

3.07 HOT APPLIED FLEECE BACKED MEMBRANE

A. Fully Adhered Application: Fully adhere membrane to acceptable substrate with hot asphalt applied at the rate specified by the manufacturer.
1. The roof surface must be clean, dry and free of foreign material.
2. Position sheets as indicated on approved shop drawings.
3. Fold one end of the Elvaloy® sheet on top of itself until both ends meet. Apply hot asphalt to the prepared roof surface. The sheet can then be pulled and laid into the bonding material using care not to create any wrinkles.
4. Carefully push into place from fold line to overlap, avoiding wrinkles and air pockets. Roll or broom membrane flat. Using a water-filled lawn roller, roll the membrane into the hot asphalt to seat the membrane into the hot asphalt. No exceptions.
5. Repeat procedure for other sheet half.
6. Lap seams shall be done by lapping the two inch (2") selvedge edge over the non-selvedge edge of the previous roll. The selvedge edge seam shall be made with the heat gun method.
7. Roll ends are butted together and capped with a six inch (6") wide trim strip. The trim strip is then seamed with the heat gun.
8. T-Joint covers are required over all T-joints on installations of thermoplastic roofing membranes equal too or greater than 60 mils in thickness. Center T-Joint cover over the T-joint and completely hot air weld the cover to the field membrane.

B. Lap Seaming Procedure: Overlap membrane for attachment method specified and hot-air welded with manufacturer's approved equipment.
   1. All surfaces to be weld shall be clean, dry and free of foreign material.
   2. All seams must then be checked with a needle probe and any voids repaired with the heat gun.

3.08 FLASHING

A. Flash all penetrations, metal edge systems, walls, curbs, expansion joints, drains as shown on details and approved shop drawings with white reinforced Elvaloy® flashing membrane.
   1. Use prefabricated flashing accessories or components such as sealant pockets, premolded vent/pipe flashing.
   2. Mechanically fasten flashing at terminations according to approved details.
   3. Fastening membrane flashing through metal counterflashing is not acceptable.

B. Any lumber or shimming required for attachment or to make material flashing flush or level with offsets and/or transitions shall be incorporated in the flashing specifications.

3.09 BASE FLASHING (APPROXIMATELY 8" IN HEIGHT MINIMUM)

A. Base flashings shall be installed using the flashing membrane, with length of run not to exceed twenty linear feet (20').

B. Wooden nailers or curbs shall be installed at all edges and openings in the roof, mechanically fastened to the deck.

C. Cant strips shall be installed at the intersection of the deck and all vertical surfaces.

D. The roofing field membrane shall extend up over and two inches (2") above the top of cant strips at all vertical intersections or out to the roof's edge.

E. All existing substrates receiving flashing membrane shall be clean and primed with primer, prior to application as required.

F. All flashings shall be mechanically fastened with a termination bar a maximum of six inches (6") on center, be a maximum of eight inches (8") above finished roof height, extend a minimum of four inches (4") onto the field of horizontal roof membrane, and not exceed twenty linear feet (20') of run in length.

G. After proper termination of the base flashing at a minimum eight inch (8") height (or maximum eighteen inch (18") height), a saw cut reglet with counterflashing shall be installed according to NRCA and SMACNA guidelines.

H. All vertical flashing lap seams of the flashing membrane shall be hot-air welded.

I. All flashing membrane shall be adhered with flashing bonding adhesive to the vertical substrate and hot-air welded to the field of roof membrane; hot-air weld vertical laps.

J. Flashing laps shall be minimum two inch (2") width, no maximum. Hot-air weld of flashing lap shall be minimum two inch (2") width, no maximum.

K. Hot-Air Welding of Flashing Laps:
1. When using a hand-held hot-air welder, the seams should be pressed together using a hand-held roller. The speed and temperature settings of the welding equipment can be affected by the weather conditions at the site of application, therefore, these parameters should be set by trial and error using two (2) pieces of the flashing membrane. Minimum width of hot-air weld two inches (2"), no maximum.
2. Lay the laps together and apply pressure to the welded seam to ensure full adhesion.
3. Allow the seams to set fully, and probe the entire length for voids. Reseam voids immediately with a hot-air gun and roller.

L. All hot-air welded seams/laps shall be tested daily with a probe for integrity, no variance.

3.10 VERTICAL WALL FLASHING (FOR USE APPROXIMATELY 8-18" ABOVE THE FINISHED ROOF LINE AND EXTENDING UPWARD)

A. Flashing membrane shall be installed on the vertical beginning a minimum of eight inches (8") above the finished roof line (where the base flashing is terminated), with length of run not to exceed ten feet (10'). Flashing shall be installed in strict accordance with the manufacturer's recommendations.

B. The termination bar used to terminate the minimum eight inch (8") high base flashing shall be used to terminate the lower edge of the vertical flashing. This will cause the termination bar to be buried at the termination point. Care should be taken to ensure the top edge of the base flashing and bottom edge of the vertical flashing are both secured.

C. All existing substrates receiving flashing membrane shall be clean and primed with asphalt primer, prior to application.

D. All substrates receiving welded-seam flashing membrane shall be clean and primed with primer, prior to application when applicable.

E. The vertical wall flashing membrane shall be set in flashing bonding adhesive according to manufacturer's guidelines.

F. All vertical flashing lap seams of the flashing membrane shall be hot-air welded.

G. Flashing laps shall be minimum two inch (2") width, no maximum. Hot-air weld of flashing lap shall be minimum two inch (2") width, no maximum.

H. Immediately following the laying of the flashing membrane, it shall be pressed or rolled in the width direction of the membrane. This will prevent excessive entrapment of air beneath the membrane. The pressing or rolling shall be in the width direction and with the laps so as not to buck the laps.

I. Any flashing extending further than eighteen inches (18") up onto a vertical surface, shall be installed using the strapped method and must be fastened with a termination bar or installed up and over the parapet wall and fastened to the nailer on the outside of the wall.

J. The flashing membrane shall be run up the wall in sheet widths, run under the coping cap and be terminated on the outside of the wall six inches (6") on center; then the coping cap shall be reset. All side laps are to be hot-air welded.

K. Hot-air Welding Laps:
1. When using a hand-held hot-air welder, the seams should be pressed together using a hand-held roller. The speed and temperature settings of the welding equipment can be affected by the weather conditions at the site of application, therefore, these parameters should be set by the contractor by using two (2) pieces of flashing membrane. Minimum width of hot-air weld shall be two inches (2").
2. Lay the laps together and apply pressure to the welded seam to ensure full adhesion.
3. Allow the seams to set fully, and probe the entire length for voids. Reseam voids immediately with a hot-air gun and roller.

L. All hot-air welded seams/laps shall be tested daily with a probe for integrity, no variance.

M. Any lumber or shimming required for attachment or to make material flashing flush or level with offsets and/or transitions shall be incorporated in the flashing specifications.

3.11 PERIMETER FASTENING

A. Wood nailers are required for perimeter gravel stops or drip edges. Field membrane and all plies shall be mechanically fastened to nailer on twelve inch (12") centers maximum.

3.12 EDGING FLASHINGS

A. An NRCA-approved gravel stop/fascia system shall be installed in strict accordance with published instructions to meet ES-1.

3.13 WALKWAY PADS

A. Fully adhere and heat weld walkway pads where shown on drawings or where required to provide protected pathways from rooftop access points to mechanical or other equipment requiring rooftop maintenance.

3.14 CLEANING

A. Clean exposed surfaces of excess cement, adhesive, sealants, mortar and paint associated with the new work.

B. Clean work area of excess roofing materials and installation debris daily.

C. Repair or replace defaced or disfigured finishes caused by the work.

3.15 MEMBRANE CLEANING

A. After all membrane has been installed, it shall be cleaned with a cleaning agent compatible with the membrane to return the membrane to like new appearance.

3.16 PROTECTION

A. Protect all building surfaces against damage from roofing work.

B. Where traffic must continue over finished, installed roofing system, protect membrane, underlayment accessories and finishes from damage.

3.17 MEMBRANE PROTECTION

A. Where equipment pads, wood sleepers, or walkway slabs are to be installed over the roofing membrane, an additional layer of the roofing membrane shall be installed between the roofing membrane and the pad, sleeper, or slab. Due caution shall be exercised to prevent roofing membrane damage during placement. Where required, membrane shall be welded to field membrane to prevent slippage.

3.18 PIPING/CONDUIT

A. Piping/conduit shall be raised to NRCA recommended heights, and new supports furnished. Permanent supports shall be installed upon pads approved by membrane manufacturer. Coordinate work with Owner's representative.

B. All gas lines, piping, and conduits shall be coated with industrial grade yellow paint.

C. Gas lines three inches (3") and over must be supported on wood block with pipe roll stands.

3.19 OVERNIGHT SEAL

A. Shall be performed according to accepted roofing practice as outlined in the NRCA Roofing Manual, SPRI and membrane manufacturer's recommended procedure.

B. The roofing membrane shall be sealed to the roof deck or existing roof at the end of the day or at the onset of inclement weather to prevent water from flowing into the completed roofing system. Temporary seals shall be removed upon resumption of work.

END OF SECTION 07535

SECTION 07600 - SHEET METAL AND MISCELLANEOUS ACCESSORIES FOR FULLY ADHERED MULTI-PLY ROOF SYSTEM

PART 1 - GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. Section Includes:
1. Provide flashing and sheet metal components for moisture protection.
2. Related accessories.

1.02 SUBMITTALS

A. Product Data:
1. Submit shop drawings, product data and mockups of all sheet metal.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers in satisfactory use in similar service for five (5) years. Use experienced installers. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Reference Standards: Applicable portions of ASCE, SMACNA, ASTM and NAAMM publications.

1.04 WARRANTIES

A. Manufacturer's Product Warranty: Submit manufacturer's standard limited product warranty signed by the manufacturer's authorized official, guaranteeing to correct failures in product which may occur during the warranty period, without reducing or otherwise limiting any other rights to correction which the Owner/Project Consultant may have under the contract documents. Failure is defined to include product failure which leads to interruption of a watertight installation. Correction may include repair or replacement of failed product.

B. Contractor's Warranty Period: For roofing flashing and sheet metal, provide a written warranty which shall warrant work to be free of leaks and defects in materials and workmanship for two (2) years, starting from date of substantial completion.

C. Defects of the sheet metal occurring during the warranty period shall be promptly corrected by the contractor, and defects of the roofing shall be promptly corrected by the manufacturer at no additional cost to the Owner. Upon notification from the Owner or the Owner's representative that evidence of a defect exists, the responsible party shall immediately inform the Owner's representative of the date on which corrective work will be scheduled, and shall notify the Owner's representative when the corrective work has been completed.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIAL

A. Hot-dipped Galvanized Steel for use as counterflashings (where not visible from the ground) and expansion joints: Minimum 24-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

B. Elvaloy® Cladded Metal for Pitch Pans: Shall be G-90 galvanized steel with 25 mil Elvaloy® membrane.

C. Elvaloy® Cladded Metal: Shall be G-90 galvanized steel with 25 mil Elvaloy® membrane lamination; width shall be four feet (4'), length shall be eight feet (8') or ten feet (10').

D. Hot-dipped Galvanized Steel for use as continuous clips: Minimum 20-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.

E. Prefinished Galvanized Sheet Steel (where visible from the ground): Shall be 24-gauge flat stock, prefinished with Kynar finish meeting ASTM A 446, forty-five and one-half inches to forty-eight inches width by one hundred twenty inches in length (45-1/2" - 48" x 120") for use as new metal edge gravel guard, downspouts, gutters, coping and miscellaneous metal.

F. Stainless Steel: QQ-S-766, Class 301, 302, 304, or 316; or ASTM A 167, Type 301, 302, 304, or 316; form and condition most suitable for the purpose.

G. Aluminum and Aluminum Alloy Plate and Sheet: QQ-A-250; form, alloy, and temper shall be that most suitable for the purpose.

H. Sheet Lead: QQ-L-201, Grade B.

I. All existing sheet metal shall be replaced with new metal of like gauge and type, or as specified on drawings.

J. All prefinished metal color shall be as selected by Owner/Architect from manufacturer's full range of colors, including metallics.

2.02 FASTENERS

A. Fasteners shall be same metal as flashing/sheet metal, or other non-corrosive metal as recommended by sheet manufacturer for the specific application. Match finish of exposed heads with material being fastened.

B. Fasteners and fastening plates or bars shall be listed in the FM Global Approval Guide.

C. Fastener for Brick: Shall be one-fourth inch by two inches (1/4" x 2"), zinc with plated steel or stainless steel nail, one piece unit, flat head.

D. Screws: Self-taping sheet metal type with neoprene washer, as appropriate.

E. Pop Rivets: Full stainless steel Series 42 or 44, as appropriate.

F. Continuous Clip: Concealed hold-down clip type; of same materials as coping, gravel guard, sized to suit application. Use a continuous clip, minimum 20-gauge G-90 galvanized.

2.03 RELATED MATERIAL

A. Plastic Cement: FS SS-C-153, cutback asphalt type.

B. Solder: QQ-S-571 composition best suited for purpose; use high tin content, minimum 60/40, for stainless steel and monel alloy.

C. Solder: For use with galvanized steel or copper, provide 50-50 tin/lead solder (ASTM B 32), with rosin flux.

D. Copper, Sheet, and Strip: QQ-C-576, ASTM B 370, light cold-rolled temper, minimum 16 ounce.

E. Sealant (for Sheet Metal): One-component polyurethane, conforming to requirements of FS TT-S-230C, non-staining and non-bleeding.

F. Miscellaneous Materials:
1. Downspout Boots: Provide and install cast iron by Neenah Foundry Company, or pre-approved equal.
2. Splash Blocks: Concrete, 3000 psi, 28 days. Provide and install with protection pads at all downspouts. Dimensions shall be a minimum eighteen inches wide by thirty-six inches long (18" x 36").
3. Metal Accessories: Provide and install sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size, and gauge required for performance.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, substrates are smooth and clean and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed and secure.

C. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating work. Provide all shop drawings and mock-ups one month prior to installation to the Owner/Project Consultant for approval.

B. Install starter and edge strips and cleats before starting installation.

3.03 FABRICATION - GENERAL

A. Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer's instructions and recommendations. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.

B. Fabricate edge metal/fascia, gutters/downspouts, counterflashings, expansion joints, and copings with new galvanized sheet metal as specified. Fabricate gravel guard and fascia to size and dimensions as indicated on the drawings. Fabricate light metal coping, gutters and downspouts as indicated.

C. Fabricate pitch pans with Elvaloy® cladded metal as specified.

D. Form sheet metal on bending brake.

E. Form materials with straight lines, sharp angles and smooth curves.

F. Fold back edges on concealed side of exposed edge to form hem (1/2" minimum).

G. Weld or solder joints on parts that are to be permanently and rigidly assembled.

H. Limit single-piece lengths to ten feet (10').

I. Fabricate corner pieces with eighteen inch (18") extensions, mitered and sealed by forming as one piece.

J. Where installing flashing directly to masonry or dissimilar materials, backpaint with bituminous paint

K. Install new metal rooftop projections. New rooftop projection details shall be as recommended in NRCA or SMACNA handbooks. All rooftop projections shall be cleaned, all joints sealed, and painted with a rust inhibitive paint.

L. All sheet metal shall be sealed and watertight.

M. Metal work should be secured so as to prevent damage from buckling or wind. Where clips are shown, these are to be continuous.

N. All metal to receive bitumen or adhesive shall be first primed with asphalt primer.

O. All prefinished metal shall be sanded and/or abraded prior to receiving primer.

P. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

Q. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

3.04 INSTALLATION

A. General: All sheet metal termination to vertical wall shall have a through-wall with receiver installed on masonry walls or prefabricated "Z" bar flashing pre-installed to fluid applied wall finished prior to installation of sheet metal termination. This applies to edge metal, base flashing closures and all vertical surface intersections. Refer to NRCA, SMACNA, and metal manufacturer's guidelines.

B. Elvaloy® cladded metal shall be fabricated as needed; follow these specifications and standard sheet metal practice for attachment to roof details.

C. Edge Metal/Fascia:
1. Shall be installed with expansion joints, ten feet (10') on center, one-fourth inch (1/4") expansion leeway, with a cover plate.
2. Secure metal flashings per specifications.
3. Lock seams and end joints.
4. Form sections identical to profiles as shown or approved similar, to match existing building.
5. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
6. Hem exposed edges one-half inch (1/2") minimum.
7. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
8. Integrate flashing in a manner consistent with detailing.
9. Provide and install continuous clip around perimeter.
10. Shall be fabricated in accordance with all SMACNA provisions.

D. Coping:
1. Install new pre-manufactured metal coping for a permanent watertight installation.
2. All coping shall be pre-manufactured to include low profile standing metal seam to meet ES-1 requirements.
3. Shall be minimum 24-gauge prefinished Kynar installed in ten foot (10') sections maximum.
4. Vertical fascia shall extend minimum two and one-half inches (2-1/2") or be minimum one and one-half inches (1-1/2") below bottom of nailer, whichever is greater.
5. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
6. Hem exposed edges one-fourth inch (1/4") minimum.
7. Provide and install continuous clip, minimum 20-gauge.
8. Shall be fabricated in accordance with published details.

E. Expansion Joint Field and at Wall:
1. Shall be as outlined by details, and be in full compliance with these specifications.
2. Lock seams and end joints.
3. Fabricate corner pieces with minimum eighteen inch (18"), maximum forty-eight inch (48") extensions, formed and sealed with rivets and sealant, as one piece.
4. Hem exposed edges one-fourth inch (1/4") minimum.
5. Backpaint flashing in contact with masonry or dissimilar materials with bituminous paint. Surface sand before applying primers.
6. Integrate flashing in a manner consistent with detailing.
7. Provide and install continuous clip, minimum 20-gauge or one gauge thicker than flashing.
8. Shall be fabricated in accordance with published details.

F. Counterflashing:
1. Provide and install new metal counterflashing as required for a permanent watertight installation.
2. Saw cut brick mortar joint to receive friction fit reglet and removable counterflashing as detailed in SMACNA Figure 4-4E.

G. Gutter and Downspout:
1. Fabrication:
a) Fabricate gutter and downspout of profile and size indicated.
b) Field measure site conditions prior to fabricating work.
c) Fabricate with required connection pieces.
d) Fabricate section square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.
e) Hem exposed edges of metal.
f) Form and seal all metal joints; provide for expansion joints per SMACNA.
2. Installation:
a) Install gutter, downspout, and accessories.
b) Join lengths with seams pop riveted and sealed watertight. Flash and seal gutter to downspouts and accessories.
c) Seal all metal joints watertight for full metal surface contact.
d) Gutter: SMACNA style profile; submit detail for approval.
e) Downspouts: Rectangular profile. Seal all joints, six inches by six inches (6" x 6") minimum.
f) Support Brackets, Joint Fasteners: Profiled to suit gutters and downspouts.
g) Anchorage Devices: SMACNA requirements. Type recommended by fabricator.
h) Gutter Support: Kynar.
i) Downspout Supports: Straps, Kynar.

H. Pitch Pans:
1. Install pitch pans of 24-gauge, G-90 galvanized steel with a 25 Mil Elvaloy® Kee membrane lamination according to NRCA standards, minimum of six inches by six inches (6" x 6").
2. Pitch pans shall be fabricated to a minimum of six inches (6") above the finished roof membrane. The top vertical edge of the thermoplastic clad metal must be folded over to conceal the uncoated side of the metal inside the pitch pan. The pitch pan flange must be a minimum of three and one half inches (3.5”) wide in contact with the horizontal roof plain or field of roof membrane.
3. Approved caulking or water block shall be applied under the pitch pan flange prior to securing the flange to the deck with approved fasteners a minimum of 4” on center.
4. All projections enclosed in pitch pans shall be cleaned in any manner suitable and coated with a rust inhibitive coating as approved by the Owner/Project Consultant. Coating shall be allowed to dry prior to pitch pan fill.
5. Base of pitch pans shall be filled with grout or cementitious binder to proper height and allowed to cure.
6. Top finish fill shall be self-leveling, one-part urethane, with maximum fill to within three-eighths inch (3/8") of top of pitch pan sides.
7. Strip the thermoplastic clad metal flange of the pitch pan to the field membrane with one strip of flashing membrane. The flashing membrane must extend from the outer edge of the pitch pan flange onto the field membrane a minimum of three inches (3") and butt to the vertical sides of the pitch pan on all 4 sides. The flashing membrane shall be hot air welded to the thermoplastic clad metal pitch pan and to the field membrane. Hot air welds shall be a minimum of two inches (2”) wide.
8. Install preformed outside corners by hot air welding in place at all four (4) corners of the pitch pan.
9. Apply seam sealer to the edges of the flashing membrane.

I. Bonnets/Hoods:
   1. Fabricate and install above all pitch pans, where necessary, or reinstall as applicable, metal bonnets over all pitch pans, NO EXCEPTIONS.
   2. Bonnets/Hoods shall be manufactured with metal compatible with metal to which bonnet is to be attached.
   3. On beams and other steel, weld in place bonnets fabricated from one-fourth inch (1/4") steel plate.
   4. Draw band bonnets fabricated from 22-gauge galvanized steel may be used on circular projections.

3.05 FINISH

A. Backpaint concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals. Exposed surfaces to be provided with a factory applied fluorocarbon Kynar finish meeting ASTM A 446 and AAMA specification 605.2 for high performance coating.

B. New 24-gauge hot-dipped galvanized metal shall be painted on all locations visible from the ground with an industrial grade paint as selected by Project Manager/Architect from manufacturer's full range of colors, including metallics. Galvanized metal surface must be properly prepared by removing all oil, grease, and/or protective mill coatings by solvent cleaning surface in accordance with SSPC-SP1, and according to paint manufacturer's recommendation, to ensure proper adhesion of paint to metal.

END OF SECTION

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SECTION REQUIREMENTS

A. Submittals: Product Data and color Samples.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.

B. Elastomeric Sealants: Comply with ASTM C 920.

1. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, M, and O, with the additional capability to withstand [50 percent movement in both extension and compression for a total of 100 percent movement] [100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement]. Use for building expansion joints.
2. Single-component, nonsag polysulfide sealant, Type S; Grade NS; Class 12-1/2; Uses NT, M, G, A, and O. For general exterior use.
3. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. For general exterior use.
4. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; and Uses NT, M, A, and O. For general exterior use.
5. Single-component, nonsag urethane sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. Use for exterior traffic-bearing joints, where slope precludes use of pourable sealant.
6. Single-component, pourable urethane sealant, Type S; Grade P; Class 25; Uses T, M, G, A, and O. Use for exterior traffic-bearing joints.

7. Single-component, mildew-resistant silicone sealant, Type S; Grade NS; Class 25; Uses NT, G, A, and O; formulated with fungicide. Use for interior sealant joints in ceramic tile, stone, and other hard surfaces in kitchens and toilet rooms and around plumbing fixtures.

C. Latex Sealant: Single-component, nonsag, mildew-resistant, paintable, acrylic-emulsion sealant complying with ASTM C 834. For interior use only at perimeters of door and window frames.

D. Acoustical Sealant for Exposed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834. For interior use only at acoustical assemblies.

E. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound. For interior use only at acoustical assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 1193.

B. Comply with ASTM C 919 for use of joint sealants in acoustical applications.

END OF SECTION 07920

SECTION 07951 - EXPANSION AND SEISMIC JOINT COVERS

PART 1 — GENERAL

1.01 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.02 WORK INCLUDED

A. Furnish and install complete Expansion Joint Cover Systems.

1. Interior Floor expansion joint covers.
2. Interior Wall expansion joint covers.
3. Interior Ceiling expansion joint covers.
4. Exterior Wall expansion joint covers.

1.03 RELATED WORK

A. Related work which is specified elsewhere.

1. Cast-In-Place Concrete: Section 03300.
2. Unit Masonry: Section 04220.
3. Structural Steel: Section 05120.
4. Gypsum Wallboard: Section 09250.

1.04 REFERENCES

A. Publications listed herein are part of this specification to the extent referenced. The criteria established in the specifications shall take precedence over the standards referenced herein.

1. American Society for Testing and Materials (ASTM):
   a. ASTM B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

1.05 DEFINITIONS

A. Define industry and product terms as necessary.

1.06 SYSTEM DESCRIPTION

A. Joint covers shall permit unrestrained movement of joint without disengagement of cover.

B. Allowable load on floor joint cover plate shall be 100 psf uniform load and 300 pounds concentrated load with maximum 12,000 psi stress (6063-T5 aluminum extrusions) at full open position.

1. Deflection shall be 1/16 inch at neutral position.
2. In the absence of load selections the minimum load will apply – 50 psf with 1/8 inch deflection.

C. Centering Bars shall have [nylon spheres] [pins] which fully engage with the base members' tracks.

D. Fire rated joint covers shall have been tested by an independent, nationally recognized testing and listing entity in accordance with ANSI/UL No. 263, ASTM E119, UL 2079, or ASTM E1966, including hose stream test, where applicable, at the full rated period. Covers shall be listed with an independent, nationally recognized testing and listing entity. Fire rating shall be not less than the fire rating of adjacent construction.

1.07 QUALITY ASSURANCE

A. Manufacturer: Obtain joint cover assemblies through one source from a single manufacturer.

1. Manufacturer shall be ISO 9001:2000 Certified.
    A. The Manufacturer shall have documented management and control of the processes that influence the quality of its products.
    B. The Manufacturer shall have documented management and control of the processes that influence the quality of its customer service.
2. Manufacturer shall have a minimum of ten (10) years of experience in the fabrication of expansion joint cover assemblies.

B. Installer: Firm with not less than three (3) years of successful experience in the installation of systems similar to those required by this project and acceptable to the manufacturer of the system.

1.08 SUBMITTALS

A. Submission must be made within ten (10) working days of the General Contract award to avoid project delay.

1. Submit manufacturer's specifications and technical data, including Material Safety Data Sheets, installation instructions, and, as required, catalog cuts and templates to explain construction and to provide for incorporation of the product into the project.
2. Submit certificates, copies of independent test reports, or research reports showing compliance with fire resistance rating and other specified performance requirements.
3. Submit shop drawings showing complete fabrication details for all joint covers, including required anchorage to surrounding construction, recesses, blocking, backing and connections between similar and dissimilar joint cover assemblies.
4. Submit three (3) 6" samples of the specified system.

1.09 DELIVERY, STORAGE AND HANDLING

A. Provide temporary protective cover on anodized aluminum finished surfaces.

B. Deliver joint covers to jobsite in new, clean, unopened crates of sufficient size and strength to protect materials during transit.

C. Store components in original containers in a clean, dry location.

1.10 SEQUENCING

A. Submittals shall be completed and approved prior to award of subcontract for system components.

B. Subcontract for the work of this section shall be planned to allow sufficient time for manufacturer's production and delivery scheduling.

1.11 WARRANTY

A. Submit manufacturer's warranty that materials furnished will perform as specified for a period of not less than one (1) year when installed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Furnish and install as noted in specifications and as indicated on drawings, Expansion Joint Cover Types; NBA-1, NBAL-1, 6TW-1, 1C1, 9WC-2, AVL-1, AV-1 manufactured by: Balco, Inc., PO Box 17249, 2626 S. Sheridan, Wichita, KS 67217; phone: 800-767-0082 or (316) 945-9328; fax: (316) 945-0789.

B. Substitutions: In Accordance with Section 01600 Substitution Procedures.

2.02 MATERIALS

A. Expansion joint cover systems shall be Balco, Inc. NBA-1, NBAL-1, 6TW-1, 1C1, 9WC-2, AVL-1, AV-1

1. Aluminum:
   a. ASTM B221, alloy 6063-T5 for extrusions
   b. ASTM B209, alloy 6061-T6 for plate
   c. ASTM B209, alloy 5052-H32 for sheet
2. Stainless Steel: ASTM A666, alloy 304 for sheet and plate
3. Centering Bars: shall be spring steel, alloy 1074, and shall have thermoplastic elastomer spheres which fully engage with the base members' tracks
4. Water Barrier: Flexible EPDM, Class I, ASTM D4637, 45 mils thick (minimum) sheet
5. Fire Barrier: Metaflex Classic tested in accordance with ASTM E119/ASTM E814,
6. Fasteners, accessories, sealant and other materials required for complete installation in accordance with the manufacturer's written installation instructions.

2.03 FABRICATION

A. Fabricate expansion joint cover assemblies as detailed. Provide centering bars, sealing washers, gaskets, splice covers, and closures as necessary for complete installation.

1. Fabricate special transitions and corner fittings as required.

2. Fabricate fire barrier and provide fire-resistant sealant as required for fire-resistant installations.
3. Miter and weld joint systems as applicable.
4. Provide necessary and related parts, devices, water barrier (if specified), anchors, form clips and other items required for water-resistant and fire-resistant installation.
5. Provide corners, tees, transitions, curb risers, etc. assembled with connection [mitered] [interlocking] and secured to ensure proper fit and alignment as applicable.
6. Special conditions shall be shop fabricated.
7. Cover plates shall have a smooth 1/8 inch recessed exposed surface.

B. Shop assemble components and package with anchors and fittings. Provide components in single lengths where possible; minimize site splicing.

2.04 FINISHES

A. Aluminum:
1. Floors and Exterior Walls – Mill finish.
2. Interior Walls and Ceilings – Clear anodized, Class II, AA-M12 C22 A31; 204-R1
3. In contact with concrete – Prime painted.

B. Steel shall be galvanized in accordance with ASTM A123.

C. Filler Strips: Gray (standard).

PART 3 — EXECUTION

3.01 EXAMINATION

A. Verify that field measurements and blockout dimensions are as shown on shop drawings prior to releasing materials for fabrication by the manufacturer.

B. Installer shall examine conditions under which work is to be performed and shall notify the contractor in writing of unsatisfactory conditions. Installer shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 INSTALLATION

A. Install expansion joint covers in accordance with the manufacturer’s instructions. Align work plumb, level, and flush with adjacent surfaces. Rigidly anchor to substrate. Make allowances for change in joint size due to difference between installation and building operating temperatures.

B. Set centering bars diagonally at 20 inches on center maximum (or 10 inches on center for heavy-duty models). Centering bars shall be fully engaged with the base members.

C. Fire Rated Joint Covers: Install fire rated covers to requirements of applicable fire rated design. Install fire barriers and flame sealant as required.

D. Water Barrier: Provide water barriers at exterior joints and where called for on Drawings. Provide drainage fittings where called for on Drawings.

3.03 ADJUSTING AND PROTECTION

A. Adjust joint cover to freely accommodate joint movement.

B. Protect the installation from damage by work of other Sections. Where required, remove and store cover plates and install temporary protection over joints. Re-install cover plates prior to Substantial Completion of work.

END OF SECTION

SECTION 08113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 08 Section "Access Control Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL 10C.
   1. Smoke Control Door Assemblies: Comply with NFPA 105.

      a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.9 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.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Steelcraft.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 16 gauge (0.053-inch -1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 16 gauge (0.053-inch -1.3-mm) (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

Hollow Metal Frames:

4. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
5. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

6. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
7. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
8. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
9. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
10. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
11. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
12. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
13. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08113

SECTION 08146 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Related Sections:
1. Division 08 Section “Door Schedule”.
2. Division 08 Section "Hollow Metal Doors and Frames".
3. Division 08 Section "Glazing".
4. Division 08 Section "Door Hardware".
5. Division 08 Section "Access Control Hardware".

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.4 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
6. Indicate construction details not covered in Product Data.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide samples for each species of veneer and core material.
b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors’.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL10C.

1. Smoke Control Door Assemblies: Comply with NFPA 105.

1) Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. 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 wood face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty includes 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

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.

2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

2.2 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.

2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.

3. Blocking: As indicated under article “Blocking”.

B. Fire Resistant Composite Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

2. Blocking: As indicated under article “Blocking”.

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.

2.3 BLOCKING

A. Non-Fire-Rated Doors:

1. Provide blocking as indicated below:

a. HB3: 5 inch top and bottom rail blocking, in doors indicated to have closers and kick plates.

B. Fire Rated Doors:

1. Provide blocking as indicated below:

a. HB1: 5 inch in doors indicated to have closers and overhead stops.

2.4 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eggers Industries: Premium Series.
2. Graham: GPD Series.
3. Marshfield: Signature Series.
4. VT Industries: Artistry Series.

B. Interior Solid Core Doors:

1. Grade: Premium.

2. Match between Veneer Leaves: Book match.

3. Assembly of Veneer Leaves on Door Faces:

   a. Running Match.

4. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

5. Transom Match: Continuous match.

6. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

7. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

9. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.5 LIGHT FRAMES AND GLAZING

A. Metal Frames for Light Openings Wood Doors up to and including 20-minute rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

   1. Manufacturers:

      a. Air Louver.
      b. All Metal Stamping.
      c. Anemostat.
      d. Pemko.

B. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.6 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.
   1. Comply with requirements in NFPA 80 for fire rated doors.
   2. Undercut: As required per manufacturer’s templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."

D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.
2. Staining:
   a. As selected by Architect from manufacturer's full range.
   b. Custom stain to match architect’s sample.
3. Sheen: Satin.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames 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. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors 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.

END OF SECTION 08146

SECTION 08330 - OVERHEAD COILING SERVICE DOORS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SECTION INCLUDES

A. Overhead coiling service doors.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Support framing and framed opening.

B. Section 06200 - Finish Carpentry: Wood jamb and head trim.

C. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09900 - Painting: Field applied finish.

E. Section 16130 - Raceway and Boxes: Conduit from electric circuit to door operator and from door operator to control station.

F. Section 16150 - Wiring Connections: Power to disconnect.

1.3 REFERENCES

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA MG 1 - Motors and Generators.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Overhead coiling service doors:
   1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components.
   2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Details of construction and fabrication.
   4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer’s limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Warranty: Manufacturer’s limited door warranty for 2 years for all parts and components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 OVERHEAD COILING SERVICE DOORS

A. Industrial Doors: Overhead Door Corporation Model 610 Service Door.

1. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

a. Curved profile type C-187 for doors up to 15 feet 4 inches (4.67 m) wide, fabricated of:
1) 22 gauge galvanized steel.

2. Finish:
a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.

1) Powder coat: PowderGuard

(a) PowderGuard Weathered Finish: Industrial textured powder coat provides a thicker, more scratch resistant coat. Applied to entire door system including slats, guides, bottom bar and head plate.

3. Weatherseals:
   a. Vinyl bottom seal.

4. Bottom Bar:
   a. Two galvanized steel angles.

5. Guides: Three structural steel angles.
   a. Finish: PowderGuard Weathered finish with iron/black powder.

6. Brackets:
   a. Galvanized steel to support counterbalance, curtain and hood.

7. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

8. Hood:
   a. 24 gauge galvanized steel with intermediate supports as required.

9. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
   a. Sensing Edge Protection:
      Pneumatic sensing edge.
   b. Operator Controls:
      Push-button operated control stations with open, close, and stop buttons.
   c. Motor Voltage: 115/230 single phase, 60 Hz.

10. Windload Design:
    a. Standard windload shall be 20 PSF.

11. Locking:
    a. Interior slide bolt lock for electric operation with interlock switch.

12. Wall Mounting Condition:
    a. Face-of-wall mounting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

G. Install perimeter trim and closures.

H. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 08411 – ALUMINUM STOREFRONT

PART 1 - GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SUMMARY

A. Related Documents: Conditions of the Contract, Division 1 - General Requirements, and Drawings apply to Work of this Section.

B. Section Includes:
1. Entrance and storefront systems, complete with reinforcing, fasteners, anchors and attachment devices.
2. Aluminum doors complete with hardware.
3. Accessories necessary to complete work.

C. Related Sections:
1. Section 01400 - Quality Requirements.
2. Section 05500 - Metal Fabrications.
3. Section 06100 - Rough Carpentry.
4. Section 07920 - Joint Sealants.
5. Section 08710 - Door Hardware.
6. Section 08810 - Glass and Glazing.

1.2 REFERENCES

A. Aluminum Association (AA):
1. DAF-45 Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA):
1. 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
2. 701.2 Specifications for Pile Weatherstripping.
3. Manual #10 Care and Handling of Architectural Aluminum From Shop to Site.
4. SFM-1 Aluminum Storefront and Entrance Manual.

C. American National Standards Institute (ANSI):
1. A117.1 Safety Standards for the Handicapped.

D. American Society for Testing and Materials (ASTM):

1.	A36	Structural Steel.
2.	B209	Aluminum and Aluminum - Alloy Sheet and Plate.
3.	B221	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
4.	B308	Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
5.	C509	Cellular Elastomeric Pre-formed Gasket and Sealing Material.
6.	C864	Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
7.	E283	Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
8.	E330	Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
9.	E331	Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

E. Federal Specifications (FS):

1.	TT-P-645A	Primer, Paint, Zinc Chromate, Alkyd Type.

F. Steel Structures Painting Council (SSPC):

1.	Paint 12	Cold-Applied Asphalt Mastic (Extra Thick Film).

1.3 SYSTEM REQUIREMENTS

A. Design Requirements:

1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
3. Provide concealed fastening.
4. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
6. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
7. Provide for expansion and contraction without detriment to appearance or performance.
8. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

B. Performance Requirements:

1. Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot (0.0003 m3/sm2) of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf (300 Pa).

2. Water infiltration: No uncontrolled water penetration when tested in accordance with ASTM E 331 at test pressure of 8.0 psf 380 Pa.

C. Thermal Requirements:
1. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees Fahrenheit (82 degrees Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
2. Ensure doors function normally within limits of specified temperature range.

D. Structural Requirements, as measured in accordance with ANSI/ASTM E330:
1. Wind loads for exterior assemblies:
a. Basic loading:
1) [_____] psf acting inward.
2) [_____] psf acting outward.

2. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/175 of its clear span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.4 SUBMITTALS

A. General: Submit in accordance with Section 01340.

B. Product Data:
1. Submit manufacturer's descriptive literature and product specifications.
2. Include information for factory finishes, hardware, accessories and other required components.
3. Include color charts for finish indicating manufacturer's standard colors available for selection.

C. Shop Drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems.

2. Include following:
a. Fully dimensioned plans and elevations with detail coordination keys.
b. Locations of exposed fasteners and joints.

3. Provide detailed drawings of:
a. Composite members.
b. Joint connections for framing systems and for entrance doors.
c. Anchorage.
d. System reinforcements.
e. Expansion and contraction provisions.
f. Hardware, including locations, mounting heights, reinforcements and special installation provisions.
g. Glazing methods and accessories.
h. Internal sealant requirements as recommended by sealant manufacturer.

4. Schedule of finishes.

D. Samples:

1. Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.
2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports:

1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

F. Certificates:

1. Submit manufacturer's certification stating that systems are in compliance with specified requirements.

G. Qualification Data:

1. Submit installer qualifications verifying years of experience.
2. Include list of projects having similar scope of work identified by name, location, date, reference name and phone number.

H. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility:

1. To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.

C. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.

D. Conform to requirements of ANSI A117.1 and local amendments.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of Section 01600.

B. Protect finished surfaces as necessary to prevent damage.

C. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.

D. Do not leave coating residue on any surfaces.

E. Replace damaged units.

1.7 WARRANTY

A. Provide warranties in accordance with the Contract General Conditions.

B. Provide written manufacturer's warranty, executed by company official, warranting against defects in materials and products for two (2) years from date of Substantial Completion.

C. Provide written installer's warranty, warranting work to be watertight, free from defective materials,

defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 1 year from date of Substantial Completion.

1. Warranty shall cover following:
   a. Complete watertight and airtight system installation within specified tolerances.
   b. Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
   c. System is structurally sound and free from distortion.
   d. Glass and glazing gaskets will not break or "pop" from frames due to design wind, expansion or contraction movement.
   e. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers

1. YKK AP America, Inc.
2. Vista Wall Architectural Products
3. Kawneer
4. Oldcastle Building Envelope

B. Substitutions: Submit under provisions of Section 01600, a minimum of 10 days prior to bid date.

C. Acceptable Entrance Doors:

1. Standard Duty Doors: Model 35D Medium Stile Door YKK AP with Mid-panel panic device system or equivalent by specified manufacturer. ADA Compliant.

D. Acceptable Storefront Framing Systems:

1. Framing System: YES 45 FI (2" x 4-1/2") YKK AP or equivalent by specified manufacturer.

2.2 FRAMING MATERIALS AND ACCESSORIES

A. Aluminum:

1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

B. Internal Reinforcing:
1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
2. Shapes and sizes to suit installation.
3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:
1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates,

bars or tubes.

D. Fasteners:

1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
2. Do not use exposed fasteners, except where unavoidable for application of hardware.
3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
4. For concealed locations, provide manufacturer's standard fasteners.
5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Glazing Gaskets:

1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
2. Conform to ASTM C509 or C864.
3. Profile and hardness as required to maintain uniform pressure for watertight seal.
4. Provide in manufacturer's standard black color.

H. Weatherstripping:

1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

I. Internal Sealants: Types recommended by sealant manufacturer.

J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

2.3 GLASS AND GLAZING ACCESSORIES

A. Refer to Section 08810.

2.4 FABRICATION

A. Coordination of Fabrication:

1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:

1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements and for support to structure.
3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.

4. Comply with Section 08810 for glazing requirements.

C. Aluminum Framing:

1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Reinforce internally with structural members as necessary to support design loads.
4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
5. Seal horizontals and direct moisture accumulation to exterior.
6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
9. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:

1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.

2. Provide extruded aluminum glazing stops of [square] [beveled and mitered (for single glazing only)] design, [permanently anchored on security side and removable on opposite side.]

E. Hardware:

1. Receive hardware supplied in accordance with Section 08710 and install in accordance with requirements of this Section.
2. Cut, reinforce, drill and tap frames and doors as required to receive hardware.
3. Comply with hardware manufacturer's templates and instructions.
4. Use concealed fasteners wherever possible.
5. Coordinate mid-panel panic device system with hardware at storefront doors to ensure compatibility.

F. Welding:

1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

G. Flashings:

1. Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.5 FINISH

A. Manufacturer's standard colors as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01400.

B. Verify dimensions, tolerances and method of attachment with other Work.

3.2 INSTALLATION

A. Erection Tolerances:

1. Limit variations from plumb and level:
   a. 1/8 inch (3 mm) in 10 feet (3 M) vertically.
   b. 1/8 inch (3 mm) in 20 feet (6 M) horizontally.

2. Limit variations from theoretical locations: 1/4 inch (6 mm) for any member at any location.

3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).

B. Install doors and hardware in accordance with manufacturer's printed instructions.

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.

F. Seal perimeter members as shown on manufacturer’s installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer’s installation instructions. Use sealants as recommended by sealant manufacturer.

G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 07920.

H. Glazing: Refer to requirements of Section 08810. Utilize "anti-walk" edge blocking on all vertical edges of glazing.

3.3 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.4 CLEANING

A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION

SECTION 08710 – DOOR HARDWARE

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Access Control Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.4 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data,

Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Seven years for heavy duty cylindrical (bored) locks and latches.
   2. Five years for exit hardware.
   3. Twenty five years for manual surface door closer bodies.
   4. Two years for electromechanical door hardware.

1.9 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

   1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

      a. Two Hinges: For doors with heights up to 60 inches.
      b. Three Hinges: For doors with heights 61 to 90 inches.
      c. Four Hinges: For doors with heights 91 to 120 inches.
      d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

    a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:

    a. Hager Companies (HA).
    b. McKinney Products (MK).
    c. Stanley Hardware (ST).

B. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Acceptable Manufacturers:

    a. ABH Manufacturing (AB).
    b. Dorma Products (DO).
    c. Rixson Door Controls (RF).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

    a. Hager Companies (HA) - ETW-QC (# wires) Option.

b. McKinney Products (MK) - QC (# wires) Option.
c. Stanley Hardware (ST) – C Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
   a. McKinney Products (MK) - Electrical Connecting Kit: QC-R001.
   b. McKinney Products (MK) - Connector Hand Tool: QC-R003.

2. Acceptable Manufacturers:

   a. McKinney Products (MK) – QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

   a. Rockwood Manufacturing (RO).
   b. Trimco (TC).

B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Acceptable Manufacturers:

    a. Rockwood Manufacturing (RO).
    b. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. Key cylinders to existing key system as directed by owner's representative.

B. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

C. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

1. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU).
    b. Sargent Manufacturing (SA).
    c. Schlage (SC).

D. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Standard.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) – CL3300 Series.
    b. Sargent Manufacturing (SA) – 10 Line.
    c. Schlage (SC) – ND Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

B. Standards: Comply with the following:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Auxiliary Deadlocks: BHMA A156.5.
3. Dustproof Strikes: BHMA A156.16.

2.8 ELECTRIC STRIKES

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a

minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Acceptable Manufacturers:

    a. Folger Adam EDC (FO).
    b. HES (HS).

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Acceptable Manufacturers:

    a. HES (HS) - 9500/9600 Series.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Rail Sizing: Provide exit device rails factory sized for proper door width application.

9. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.

3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - 700/900 Series.
b. Sargent Manufacturing (SA) - 980S Series.
c. Von Duprin (VD) - 9954 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) – DC6000 Series.
b. LCN Closers (LC) - 4040 Series.
c. Sargent Manufacturing (SA) - 351 Series.
d. Norton Door Controls (NO) - 7500 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

5. Acceptable Manufacturers:

    a. Ives (IV).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

    a. Ives (IV).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

    a. Rixson Door Controls (RF).
    b. Rockwood Manufacturing (RO).
    c. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and

provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

E. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).
3. Reese Enterprises, Inc. (RS).

2.14 ELECTRONIC ACCESSORIES

A. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Sargent Manufacturing (SA) – 3500 Series.
b. Securitron (SU) - BPS Series.
c. Von Duprin (VO) - PS.

B. Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single, dual, or multi-voltage units as shown in the hardware sets. Units must be expandable up to eight Class 2 power limited outputs. Units must include the capability to incorporate a battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Securitron (SU) - AQ Series.

2.15 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

***** All existing doors/frames to be field measured prior to any material being ordered.*****

Hardware Schedule

Set: 1.0
Doors: 300
Description: Exterior Alum Pair

2	Pivot Set	147	626	Rixson
2	Intermediate Pivot	M19	626	Rixson
1	CVR Exit Device - NL	21 AD8410 106 x 862	US32D	Sargent
1	CVR Exit Device- EO	AD8410 862	US32D	Sargent
2	Closer w/ Stop Arm	351 PS	EN	Sargent
2	Drop Plate	351D	EN	Sargent
1	Threshold	2005AT		Pemko
1	Perimeter Seal	By door mfgr		
1	Rain Guard	346C		Pemko
2	Sweep	3452AV		Pemko

Set: 2.0
Doors: 201
Description: Existing Pair - New Access Control

2	Magnetic Lock	M32BD	Securitron
1	Motion Sensor	XMS	Securitron
1	Push Button	EEB2	Securitron
1	Power Supply	AQD3	Securitron
1	Card Reader	By Security Contractor.	

Notes: Balance of existing to remain. Field verify above will work with existing door/frame.

Set: 3.0
Doors: 102, 326
Description: Exterior HM - Access Control

3	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Rim Exit Device - NL	21 8804 FSW	US32D	Sargent
1	SMART Pac Bridge Rectifier	2005M3		HES
1	Electric Strike	9500	630	HES
1	Closer w/ Stop Arm	351 PS	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	2005AT		Pemko
1	Perimeter Seal	2891APK		Pemko
1	Rain Guard	346C		Pemko
1	Sweep	3452AV		Pemko
1	Elec Cables - Strike to Above	QC-C1500P		McKinney
1	Power Supply	AQD3		Securitron
1	Card Reader	By Security Contractor.		

Set: 3.5
Doors: 118
Description: Exterior HM

3	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Rim Exit Device - NL	21 8804 FSW	US32D	Sargent
1	Closer w/ Stop Arm	351 PS	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	2005AT		Pemko
1	Perimeter Seal	2891APK		Pemko
1	Rain Guard	346C		Pemko
1	Sweep	3452AV		Pemko

Set: 4.0
Doors: 313A
Description: Sallyport HM - Access Control

3	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Rim Exit Device - NL	21 8804 FSW	US32D	Sargent
1	SMART Pac Bridge Rectifier	2005M3		HES
1	Electric Strike	9500	630	HES
1	Closer w/ Stop Arm	351 PS	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	171A		Pemko
1	Perimeter Seal	S88BL		Pemko
1	Sweep	315CN		Pemko
1	Elec Cables - Strike to Above	QC-C1500P		McKinney
1	Power Supply	AQD3		Securitron
1	Card Reader	By Security Contractor.		

Set: 5.0
Doors: 323
Description: Sallyport HM - Access Control

3	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Storeroom Lock	ND80 ATH	626	Schlage
1	Electric Strike	5000	630	HES
1	SMART Pac Bridge Rectifier	2005M3		HES
1	Closer w/ Stop Arm	351 PS	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	171A		Pemko
1	Perimeter Seal	S88BL		Pemko
1	Sweep	315CN		Pemko
1	Elec Cables - Strike to Above	QC-C1500P		McKinney
1	Push Button*****	PB4LAN-2		Securitron
1	Power Supply	AQD3		Securitron
1	Card Reader	By Security Contractor.		

****Push Button will be located in Rm #305. Approximately 80 feet of cable/power will need to be provided back to Door #323.***

Set: 6.0
Description: Exterior Mech Pair

6	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Dust Proof Strike	570	US26D	Rockwood
2	Manual Flush Bolts	555-12/72" A.F.F.	US26D	Rockwood
1	Storeroom Lock	ND80 ATH	626	Schlage
1	Surface Overhead Holder/Stop	590S	US26D	Sargent
1	Closer w/ Stop/Hold Open	351 PSH	EN	Sargent
2	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	2005AT		Pemko
1	Perimeter Seal	2891APK		Pemko
1	Rain Guard	346C		Pemko
2	Sweep	3452AV		Pemko
1	Astragal	357C		Pemko

Notes: Closer @ active leaf.

Set: 7.0
Doors: 105, 316, 327
Description: Exterior Riser/Elec

3	Hinge	T4A3386 4-1/2" x 4-1/2" NRP	US32D	McKinney
1	Storeroom Lock	ND80 ATH	626	Schlage
1	Closer w/ Stop/Hold Open	351 PSH	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Threshold	2005AT		Pemko
1	Perimeter Seal	2891APK		Pemko
1	Rain Guard	346C		Pemko
1	Sweep	3452AV		Pemko

Set: 8.0
Doors: 310
Description: Pair Court Room - Access Control

6	Hinge	T4A3786 4-1/2" x 4-1/2" NRP	US26D	McKinney
1	Removable Mullion	L980	PC	Sargent
1	Exit Device - NL Leverr	21 8804 ETL	US32D	Sargent
1	Exit Device - Dummy Lever	8810 ETL	US32D	Sargent
1	SMART Pac Bridge Rectifier	2005M3		HES
1	Electric Strike	9500	630	HES
2	Closer w/ Stop Arm	351 PS	EN	Sargent
2	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
2	Silencer	608		Rockwood
1	Elec Cables - Strike to Above	QC-C1500P		McKinney
1	Power Supply	AQD3		Securitron
1	Card Reader	By Security Contractor.		

Set: 9.0
Doors: 111
Description: Storage

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Storeroom Lock	ND80 ATH	626	Schlage
1 Wall Stop	406	US32D	Rockwood
3 Silencer	608		Rockwood

Set: 9.5
Doors: 208
Description: Storage - Bronze

3 Hinge	TA2714 4-1/2" x 4-1/2"	US10B	McKinney
1 Storeroom Lock	ND80 ATH	613	Schlage
1 Wall Stop	406	US10B	Rockwood
3 Silencer	608		Rockwood

Set: 10.0
Doors: 304
Description: Storage - OH Stop

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Storeroom Lock	ND80 ATH	626	Schlage
1 Surface Overhead Holder/Stop	590S	US26D	Sargent
3 Silencer	608		Rockwood

Set: 11.0 – Not Used

Set: 12.0
Doors: 104, 106, 110, 112, 113, 113A, 114, 305, 306, 307, 308, 308A, 309, 312, 314, 315, 318
Description: Office

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Office Lock	ND50 ATH	626	Schlage
1 Wall Stop	406	US32D	Rockwood
3 Silencer	608		Rockwood
1 Coat Hook	802	US26D	Rockwood

Set: 12.5
Doors: 206
Description: Office - Bronze

3 Hinge	TA2714 4-1/2" x 4-1/2"	US10B	McKinney
1 Office Lock	ND50 ATH	613	Schlage
1 Wall Stop	406	US10B	Rockwood

3 Silencer	608		Rockwood
1 Coat Hook	802	US10B	Rockwood

Set: 13.0 – Not Used

Set: 14.0
Doors: 107, 321
Description: Lounge/Fitness - Inswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Classroom Lock	ND70 ATH	626	Schlage
1 Closer - pull side	351 O	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1 Wall Stop	406	US32D	Rockwood
3 Silencer	608		Rockwood

Set: 14.5
Doors: 221
Description: Lounge - Inswing - Bronze

3 Hinge	TA2714 4-1/2" x 4-1/2"	US10B	McKinney
1 Classroom Lock	ND70 ATH	613	Schlage
1 Closer - pull side	351 O	EB	Sargent
1 Kick Plate	K1050 10" x 2" LDW 4BE CSK	US10B	Rockwood
1 Wall Stop	406	US10B	Rockwood
3 Silencer	608		Rockwood

Set: 15.0
Doors: 220
Description: Corr - Outswing - Bronze

3 Hinge	TA2714 4-1/2" x 4-1/2"	US10B	McKinney
1 Classroom Lock	ND70 ATH	613	Schlage
1 Closer w/ Stop Arm	351 PS	EB	Sargent
1 Kick Plate	K1050 10" x 2" LDW 4BE CSK	US10B	Rockwood
3 Silencer	608		Rockwood

Set: 16.0
Doors: 100, 101, 103, 317
Description: Access Control - Inswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Storeroom Lock	ND80 ATH	626	Schlage
1 Electric Strike	5000	630	HES
1 SMART Pac Bridge Rectifier	2005M3		HES
1 Closer - pull side	351 O	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1 Wall Stop	406	US32D	Rockwood

3 Silencer	608		Rockwood
1 Elec Cables - Strike to Above	QC-C1500P		McKinney
1 Power Supply	AQD3		Securitron
1 Card Reader	By Security Contractor.		

Set: 16.5
Doors: 322
Description: Access Control - Inswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Institutional Lock	ND82 ATH	626	Schlage
1 Electric Strike	5000	630	HES
1 SMART Pac Bridge Rectifier	2005M3		HES
1 Closer - pull side	351 O	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1 Wall Stop	406	US32D	Rockwood
3 Silencer	608		Rockwood
1 Elec Cables - Strike to Above	QC-C1500P		McKinney
1 Power Supply	AQD3		Securitron
1 Card Reader	By Security Contractor.		

Set: 17.0
Doors: 112A, 116, 117, 313
Description: Access Control - Outswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Storeroom Lock	ND80 ATH	626	Schlage
1 Electric Strike	5000	630	HES
1 SMART Pac Bridge Rectifier	2005M3		HES
1 Closer w/ Stop Arm	351 PS	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
3 Silencer	608		Rockwood
1 Elec Cables - Strike to Above	QC-C1500P		McKinney
1 Push Button	PB4LAN-2		Securitron
1 Power Supply	AQD3		Securitron
1 Card Reader	By Security Contractor.		

Notes: Push button @ 116 and 117 only.

Set: 17.5
Doors: 322A
Description: Access Control - Outswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Institutional Lock	ND81 ATH	626	Schlage
1 Electric Strike	5000	630	HES
1 SMART Pac Bridge Rectifier	2005M3		HES
1 Closer w/ Stop Arm	351 PS	EN	Sargent

1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
3 Silencer	608		Rockwood
1 Elec Cables - Strike to Above	QC-C1500P		McKinney
1 Push Button	PB4LAN-2		Securitron
1 Power Supply	AQD3		Securitron
1 Card Reader	By Security Contractor.		

Set: 18.0
Doors: 303
Description: Access Control - Outswing

3 Hinge	T4A3786 4-1/2" x 4-1/2" NRP	US26D	McKinney
1 Exit Device - NL Leverr	21 8804 ETL	US32D	Sargent
1 SMART Pac Bridge Rectifier	2005M3		HES
1 Electric Strike	9500	630	HES
1 Closer w/ Stop Arm	351 PS	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
3 Silencer	608		Rockwood
1 Elec Cables - Strike to Above	QC-C1500P		McKinney
1 Power Supply	AQD3		Securitron
1 Card Reader	By Security Contractor.		

Set: 19.0
Doors: 328, 330
Description: Shared Restroom

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Push Plate	70E	US32D	Rockwood
1 Pull Plate	111x70C	US32D	Rockwood
1 Closer - pull side	351 O	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1 Wall Stop	406	US32D	Rockwood
1 Perimeter Seal	S88BL		Pemko

Set: 20.0
Doors: 108, 109, 301, 302
Description: Sgl Restroom - Outswing

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1 Privacy Set	ND40S ATH	626	Schlage
1 Closer w/ Stop Arm	351 PS	EN	Sargent
1 Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1 Perimeter Seal	S88BL		Pemko

Set: 21.0
Doors: 305A, 319, 320
Description: Sgl Restroom - Inswing

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	McKinney
1	Privacy Set	ND40S ATH	626	Schlage
1	Closer - pull side	351 O	EN	Sargent
1	Kickplate	K1050 10" x 2" LDW 4BE CSK	US32D	Rockwood
1	Wall Stop	406	US32D	Rockwood
1	Perimeter Seal	S88BL		Pemko

Set: 22.0
Doors: 326A, 326B
Description: OH

1	Cylinder	21 41	US26D	Sargent

Notes: Balance of hardware by door mfgr. Verify cylinder type and cam required.

Set: 23.0
Doors: 324, 325
Description: Detention

3	Hinge	T4A3786 4-1/2" x 4-1/2"	US26D	McKinney
1	Institutional High Security Lock	11 9217 LNL	US26D	Sargent
3	Silencer	608		Rockwood

Set: 24.0
Doors: 200, 205, 206A, 210, 211, 212, 214, 215, 216, 218, 219, 223, 224, 225, 226

1 All Existing Hardware to Remain

Set: 25.0
Doors: 213
Description: Existing Door (Lounge) - Inswing - Bronze

4	Hinge	TA2714 4-1/2" x 4-1/2"	US10B	McKinney
1	Classroom Lock	ND70 ATH	613	Schlage
1	Closer - pull side	351 O	EB	Sargent
1	Wall Stop	406	US10B	Rockwood
4	Silencer	608		Rockwood

Notes: Field verify above will work with existing door.

END OF SECTION 08710

SECTION 08730 — THRESHOLDS, WEATHERSTRIPPING AND SEALS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install thresholds. Weatherstripping, door sweeps, and sound seals as scheduled or indicated on the drawings and as specified herein.

B. All exterior doors shall receive thresholds, weatherstripping and door sweeps whether or not indicated on the drawings.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Doors and frames.

1.4 SUBMITTALS

A. Submit manufacturer’s product literature indicating model numbers, configurations and materials.

B. Upon request submit sample sections of thresholds or seals.

C. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

1.6 QUALITY ASSURANCE

A. Installer shall have a minimum of 3 years experience in the installation of thresholds, weatherstripping and seals for projects of similar size and scope as this project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. National Guard.
B. A. J. May Co.
C. Zero International, Inc.
D. Balco, Inc.
E. Metalines

2.2 MATERIALS

A. GENERAL: Items specified below are from the catalog of the particular manufacturer named for each item. Equivalent products by other specified manufacturers shall match dimensions and profiles of the scheduled items.

B. METAL THRESHOLDS: Shall be extruded mill finished aluminum thresholds complete with ¼" stainless steel machine screws set in expansion anchors. Provide sizes and configurations as indicated in the drawings and as manufactured by A.J. May. Profiles and dimensions shall comply with state and federal regulations for the elimination of Architectural Barriers.

C. WEATHERSTRIPPING: At all exterior hollow metal doors, provide cushion weatherstripping as manufactured by A.J. May or equivalent by specified manufacturer.

D. DRIP CAP: At all exterior hollow metal doors not protected with overhang, provide aluminum duranodic drip cap as manufactured by A.J. May or equivalent by specified manufacturer. Mount on frame over door head. Mount in bed of silicone.

E. DOOR SWEEP: At all exterior hollow metal doors and aluminum doors, provide No.198NDkB duranodic aluminum/neoprene door bottom weather seal as manufactured by National Guard or equivalent by specified manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. THRESHOLDS: Install metal thresholds in solid bed of clear silicone rubber sealant using specified anchors with stainless steel screws. Field cut ends of thresholds to fit neatly around door frame configurations.

B. OTHER: Install weatherstripping, drip caps, door sweeps and seals with stainless steel screws in accordance with manufacturer's printed instructions. Set items in a bed of clear silicone rubber sealant.

3.2 ADJUSTING

A. Adjust all items for continuous snug contact to prevent water entry.

END OF SECTION

SECTION 08810 — GLASS AND GLAZING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Glazing for hollow metal doors and frames.

B. Glazing for aluminum frames.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Hollow metal doors and frames.

B. Aluminum entrances and storefronts.

C. Aluminum window systems.

1.4 SUBMITTALS

A. Submit manufacturer’s literature with material and performance descriptions for each type of glass, sealant and glazing accessories.

B. Submit detailed shop drawings indicating locations, installation and sealing methods.

C. Submit 12” x 12” physical samples of each type of tinted or wire glass and panel.

D. Obtain approved shop drawings from hollow metal supplier, aluminum frame supplier, plastic laminate door supplier.

E. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to water infiltration, air infiltration, glass failure due to improper sizing or installation, sealant failure.

1.6 QUALITY ASSURANCE

A. Glazing contractor shall have a minimum of 3 years experience in the installation of glazing products for projects of similar size and scope as this project.

B. Each piece of glass shall bear manufacturer's label indicating type.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not deliver glass or panels to the jobsite until openings are ready for glazing.

B. Deliver glass and panels in manufacturer's original protective packaging. Store in a dry, well ventilated area and take care to prevent condensation on the materials. Keep glass faces separated.

1.8 MINIMUM COMPLIANCE STANDARDS

A. SAFETY: Contractor shall be responsible for meeting all Federal and applicable code requirements for types and locations of glazing regardless of drawing indications. Comply with the current standards of the Consumer Products Safety Commission and Federal Standard 16 CFR 1201 Federal Architectural Glazing Materials Safety Standard.

B. INSTALLATION: Comply with recommendations of Flat Glass Marketing Association – FGMA Glazing Manual.

PART 2 - PRODUCTS

2.1 GENERAL

A. GLAZING SHEETS: Glazing materials shall conform to the highest qualities as specified in the following standards:
   1. Float glass: FS DD-G-451d and ASTM C1036.
   2. Float glass, heat strengthened: ASTM C1036 and ASTM C1048.
   3. Float glass, tempered: FS DD-G-1403B and ASTM C1036, ASTM C1048, ANSI Z97.1, and Consumer Product Safety Commission 16 CFR 1201.
   4. Wired glass: FS DD-G-451, ASTM C1036 and ANSI Z97.1. Misco diamond pattern.
   5. Insulating glass: ASTM C1036. Meet industry standards set by the Sealed Insulating Glass Manufacturers Association (SIGMA).

B. MISCELLANEOUS
   1. Glazing sealants: FS TT-S-1543A (silicone rubber); FS TT-S-230 (synthetic rubber); FS TT-S-001657 (butyl rubber).
   2. Glazing tape: Architectural Aluminum Manufacturer's Association.

2.2 MANUFACTURERS

A. GLASS:
1. Guardian
2. PPG Industries
3. Pilkington.

B. TEMPERING, LAMINATING AND HEAT STRENGTHENING:
1. Oldcastle
2. Trulite

C. WIRE GLASS:
1. Pilkington
2. PPG Industries

D. GLAZING TAPE:
1. TREMCO – tape, shims, setting blocks, edge blocking.

E. GLAZING SEALANT:
1. TREMCO,
2. General Electric.

2.3 MATERIALS: Types as indicated in the drawings.

A. TEMPERED GLASS: 1/4" clear and solar tint float glass tempered by the vertical or horizontal process and meeting requirements of FS DD-G-1403B.

B. WIRE GLASS: Shall be 1/4" thick. Polish plate glass reinforced with diamond pattern wire mesh No. 24 gauge minimum, with a mesh not larger than 1”.

C. HOLLOW METAL FRAME AND DOOR GLAZING SYSTEM:
1. Glazing: 1/4” Tempered.
2. Glazing tape: 1/8” x 3/8” x continuous preshimmed butyl tape; Tremco 440.
3. Setting blocks: Neoprene or EPDM in minimum 4” lengths.
4. Edge blocking: Neoprene or EPDM in minimum 4” lengths and sized to allow for 1/8” clear expansion at both vertical edges.
5. Add sealant at exterior glazing.

2.4 INSULATING GLASS

A. Solar Control Tinted Insulated Units
1. Conformance: ASTM C 1172 and complying with testing requirements in CPSC 16CFR-1201 for Category II materials.
2. Overall Thickness: 1 inch (25 mm)
3. Outboard Lite: Bronze float glass.
   a. Tinted Float Glass: ASTM C 1036, Type I, Class 2, Quality q3.
   b. Glass Thickness: 1/4 inch (6 mm).
   c. Heat Treatment: Fully Tempered, ASTM C 1048, Kind FT
4. Interspace: ½ inch (12 mm) hermetically sealed air
5. Inboard Lite: Clear float glass.
   a. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3.
   b. Glass Thickness: 1/4 inch (6 mm).
   c. Heat Treatment: Fully Tempered, ASTM C 1048, Kind FT
6. Sealant: Approved by glass manufacturer.

7. Nominal shading coefficient: 0.53

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL: Install glass without warping, binding or stress. Allow for expansion and contraction of glass due to temperature changes. Do not install sealant with surfaces or ambient temperature below 40 degrees F.

B. HOLOW METAL FRAMES AND DOORS:
1. Ensure that finish painting of doors and frames is complete.
2. Cut glazing tape to length and install against permanent stop, flush with face of stop.
3. Place setting blocks at 1/4 points.
4. Rest glass on setting blocks and press against stop for full contact and adhesion at perimeter.
5. Place continuous glazing tape on opposite-face perimeter of glass in same manner described above. Install removable stop; avoid displacement of tape; and exert pressure on tape for full continuous contact.
6. Knife trim excess of protruding tape (leave recessed for sealant at exterior glazing).
7. Do not touch glass to metal.

C. PLASTIC LAMINATE DOORS:
1. Follow procedures specified above for non-rated doors. Metal stops provided by door manufacturer.
2. Follow recommendations of door manufacturer for rated doors. Metal stops provided by door manufacturer.

D. ALUMINUM FRAMES: Follow door and frame manufacturer’s printed instructions for glazing gasketed systems. Provide watertight installation at exterior systems.

3.2 CLEANING AND PROTECTION

A. During glazing operations, provide sufficient stick-on safety labels or hang streamers on new glazing.

B. Prior to project closeout, thoroughly clean all glazing inside and out with commercial glass cleaner.

C. Reglaze any openings where glass is chipped, broken, scratched, pitted or stained.

END OF SECTION

SECTION 09200 — LATH AND PLASTER

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install plaster lathing and accessories, three coat stucco system with floated finish as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Metal studs and gypsum sheathing.

B. Insulation

C. Dampproofing and waterproofing.

D. Painting

1.4 SUBMITTALS

A. Submit manufacturer's product data describing masonry mix, waterproofing additive, oriental stucco, lath and metal accessories.

B. Submit mix design.

C. Submit a 12" x 12" lath and plaster, metal edged sample for each type of plaster and each finish texture for Architect's approval.

D. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to cracking, water infiltration, loss of adhesion, spalling or discoloration.

1.6 QUALITY ASSURANCE

A. Plaster contractor shall have a minimum of 3 years experience in the installation of plaster systems for projects of similar size and scope as this project.

PART 2 - PRODUCTS

2.1 LATHING MATERIALS

A. CHANNELS: 16 gauge, cold rolled pressed steel, galvanized. Flanges minimum 7/16" wide. Minimum weight shall be 475 pounds per 1000 lineal feet for 1-1/2" channels and 300 pounds per 1000 lineal feet for 3/4" channels.

B. METAL LATH: Copper - alloy steel as follows:

1. Interior dry areas: Flat expanded diamond mesh at ceilings and soffits. Self- furring type at sheathed walls. Galvanized or painted finish. Minimum 3.4 Ibs. per square yard.

2. Exterior and interior wet areas: Flat expanded diamond mesh at ceilings and soffits. Self-furring type at sheathed walls. Galvanized finish meeting requirements of FS QQ-Z-325C, Type 1. Minimum 3.4 Ibs. per square yard.

C. WIRE: Annealed galvanized metal wire. Minimum 18 gauge tie wire; minimum 8 gauge hanger wire.

D. LATHING ACCESSORIES: Galvanized for interior dry areas; solid zinc alloy for exterior work.
1. Casino Beads: MUcor #66 with expanded metal flange, 26 gauge.
2. Corner Beads: U.S.G. NO. 4-R, or approved equal, 26 gauge expansion type.
3. Control Joints: No. 75 per U.S.G.
4. Expansion Joints: No. 40 zinc expansion flange type per Keene.

E. Wire clips for attachment of furring channels to runner channels shall be formed hairpin clips, 8 gauge galvanized soft steel wire.

F. METAL STUDS: Provided and installed under another section of these specifications

2.2 PLASTERING MATERIALS

A. REINFORCING: Alkaline resistant fiberglass strands, 1/2".

B. PORTLAND CEMENT: ASTM C-150, Type I, white for finish coat.

C. SAND: ASTM C-144, red torpedo sand for scratch and brown coats.

D. MASONRY MIX: Pre-mixed dry masonry mortar mix meeting requirements of A.S.T.M. C-91, Type N, as manufactured by Trinity, Ideal, TXI or Lonestar.

E. FINISH: Match Existing Finish Texture. Colors shall match existing stucco colors unless otherwise selected by the Architect. Deliver to job in manufacturer's original packages, with labels intact, seals unbroken. Prepare stucco finish coat for application by mixing with water only.

F. WATERPROOFING: "Hvdrocide" as manufactured bv Sonneborn.

G. WATER: Clean, potable and free from any amounts of mineral and organic substances that would affect set of Plaster.

H. No asbestos or admixtures.

2.3 MIXES

A. SCRATCH COAT:
1. 1 sack Portland cement.
2. 2 sacks masonry mix.
3. 9 cu. ft. sharp sand
4. 1-1/2 Ibs. fiberglass strands.

B. BROWN COAT:
1. 1 sack Portland cement.
2. 2 sacks masonry mix.
3. 10 cu. ft. sharp sand.
4. 1-1/2 Ibs. fiberglass strands
5. Integral waterproofing per manufacturer's recommendations

C. Plaster mixes shall comply with ASTM C926.

PART 3 - EXECUTION

3.1 GENERAL

A. Install furring, lathing, and all plaster work level and plumb, true and rigid. Ensure that all work to be concealed by plaster has been completed and inspected prior to beginning plaster work.

B. Obtain access panels, frames, or other built-in items from the appropriate trades before beginning plaster work.

C. Exercise precautions to prevent damage to work of other crafts. Plaster droppings on glass or aluminum surfaces shall be immediately removed with clean water and soft cloths.

3.2 EXTERIOR PLASTER (STUCCO)

A. All exterior work and interior wet areas to have Portland Cement Finish 7/8" thick finished coat, texture to match existing as approved by Architect. Color and texture shall be uniform.

B. Exterior plaster and interior wet areas to include integral waterproofing, galvanized lath, and pure zinc accessories.

3.3 SUSPENDED CEILING & SOFFIT INSTALLATION

A. Install suspended ceilings or exterior soffits in indicated locations. Unless otherwise indicated, suspension system shall consist of *1-1/2"* runner channels, *3/4"* furring channels, suspended from structure above by galvanized hanger wires.

B. Space hanger wire 48" maximum in either direction for interior ceilings. Maximum 36" in either direction for stucco soffits.

C. Space runner channels 48" on center maximum for interior plaster ceilings, supported from resilient hangers; space 36" on center maximum for plaster soffits

D. Wrap each hanger wire twice around channels; secure by at least 3 turns around itself. Space furring channels 12-1/2" on center maximum and at right angles to runners.

E. Secure to runner channels with wire clips or saddle tied with 2 strands of 16 gauge tie wire giving wire ends 3 twists.

F. Isolate penetrations (such as light fixtures) with control joints and reinforce with furring channels

3.4 METAL LATH & ACCESSORIES

A. Apply metal lath to form true surfaces, straight, without sags or buckles, with long dimension at right angles to direction of supports. Secure lath to supports at 6" intervals. Secure side laps on ceilings to supports; tie at 6" intervals between supports. Lap lath at sides at least *1/2"*. Lap lath at ends at least 1", stagger laps; and locate only over supports. Break end joints of lath on alternate sheets of lath. Lath ties shall have a minimum of three complete turns.

B. Provide corner beads on external plaster corners and where indicated. Corner beads shall be single lengths where length of corner does not exceed standard stock lengths. Miter or cope beads at corners; fasten securely with tie wire spaced 8" maximum; stagger on two wings.

C. Install casing beads (stops) where plaster abuts other surfaces, at edges of plaster panels, and elsewhere as indicated. Set casing beads level, true to line. Install casing beads in lengths as long as practicable, with joints in straight runs aligned with suitable formed splices. Secure casing beads to metal lath with tie wire spaced 8" maximum.

D. Provide expansion joints in exterior and interior plaster as shown. Expansion joints shall be in single lengths where possible. Secure expansion joints to metal lath with tie wire; space ties or nail anchors not over 8" apart.

E. Provide control joints in exterior and interior plaster between expansion joints so that no panel dimension exceeds 12' or 120 square feet of area.

3.5 APPLICATION

A. Maintain temperature of at least 40 degrees F. in building prior to plaster application, until it is dry. Plaster shall be three coat work on all bases. Plaster thickness from plaster base to finished plaster surface shall be as noted on drawings but shall be a minimum thickness of 3/4" at its thinnest point. Do not combine scratch and brown coats. No irregularities shall show in finished surface, such as "cat faces", streaks, waviness, trowel, float or brush marks. Finished surfaces shall be true, uniform in texture and finish.

B. Apply scratch coat with sufficient pressure to force mortar through mesh and key firmly to lath. Scratch to form rough surfaces. Apply brown coat 48 hours after scratch coat has set; bring out to grounds; straighten to true surface with rod, darby; leave rough, and ready for finish coat.

C. Apply finish over base coat which has been wetted evenly by brushing or spraying. Apply finish coat not sooner than seven (7) days after brown coat. Provide light sand finish per approved sample.

D. Keep plaster moist for the curing period between coats. Limit thickness *of* scratch, and brown coat to maximum 3/8" each.

3.6 PLASTER CUTTING & PATCHING

A. Execute after other work is in place, and after painter has applied priming coat. Thoroughly rake out, or cut out, moisten and fill with finishing material. Float finish with adjoining work. Point up around fixtures, outlet boxes, switch plates, fittings, piping and other appliances abutting or extending into plastering.

3.7 FINISH PLASTER PROTECTION

A. Provide protection against damage for finished plaster work. Protect plastering from freezing or premature drying. Execute no plastering work in cold weather, except where work is adequately protected and proper temperatures are maintained to prevent freezing.

END OF SECTION

SECTION 09250 — INTERIOR DRYWALL SYSTEMS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install acoustical batt insulation within interior drywall partitions.

B. Provide and install all interior drywall systems including light gauge metal studs and tracks, gypsum wall board and finishing systems, suspended gypsum board ceilings and soffits, furred gypsum board.

C. Provide and install troweled firestopping system at drywall ceiling and wall penetrations at rated walls.

D. Provide and install specified corner guards at each wall corner.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Painting

B. Door frames

C. Carpentry (wood blocking)

D. Plaster on metal studs

E. Mechanical, electrical and plumbing penetrations in rated drywall systems.

1.4 SUBMITTALS

A. Submit manufacturer's product data describing all materials.

B. Submit gypsum board finish schedule indicating level of finish proposed per each area. Finish levels shall be levels 1 through 4 as specified herein and defined by "Recommended Specification: Levels of Gypsum Board Finish" as jointly published by AWCI, CISA, GA, and PDCA. Submit copy of publication with finish schedule.

C. Submit manufacturers detail drawings and detailed installation methods for fire rated penetrations and filling of voids with specified firestopping system. Submit only those systems applicable to this project.

D. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to cracking, joint tape delamination or tearing, dimpling at fastener heads, bowing or warping of wall board, cracking at metal accessories, acoustical sealant failure.

1.6 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in manufacturer's original packaging and stored flat in a covered, dry area providing protection from damage and exposure to the elements.

B. Damaged or deteriorated materials shall be removed from the premises.

C. During cold weather installation of gypsum panels and joint finishing, temperatures within the building shall be maintained within the range of 50 degrees to 80 degrees F. Adequate ventilation shall be provided to carry off excess moisture.

D. Steel framing and related accessories shall be stored and handled in accordance with AISI's "Code of Standard Practice"

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Drywall Framing:
1. ClarkDietrich Building Systems

B. Gypsum Board and Related Accessories:
1. United States Gypsum Co.
2. National Gypsum Co.
3. Georgia Pacific
4. Temple Inland
5. James Hardie

C. Acoustical Batts:
1. Owens-Corning
2. Certaineed
3. Manville

D. Acoustical Sealant:
1. TREMCO
2. Ohio Sealants, Inc.

E. Specialty Trims:
1. Fry Reglet Corp.
2. MM Systems Corp.

F. Corner Guards:
1. WallProtex, (877) 880-8115

2.2 FRAMING: Comply with ASTM C645-09 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645-09 requirements for metal unless otherwise indicated.

2. Protective coating: Comply with ASTM C645-09; roll formed from hot dipped galvanized steel; complying with ASTM A1003/A1003M and ASTM A653/A653M G40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 galvannealed products are not acceptable.

A. METAL STUDS: 25 gauge galvanized roll formed, screw channel type studs with minimum 5/16 inch flanges and 1-1/4 inch legs. Provide widths of 3-5/8 inch and as indicated in the drawings. Provide conduit punchouts at 24" o.c.

1. "EQ" (Equivalent Gauge Thickness) Steel Studs and Runners: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86-2010 (approved February 2010 Effective March 1, 2010) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C645-09.

2. Non-structural Studs: Cold-formed galvanized steel C-studs, ClarkDietrich Building Systems Pro STUD drywall studs as per ASTM C645-09 for conditions indicated below:

a. Flange Size: 1 1/4 inch (32mm)

b. Web Depth: As specified on drawings, 3-5/8 inches.

c. Member Description: ProSTUD 25 (25ga equivalent drywall stud) 70ksi Minimum Thickness: 0.0150 inches (0.3810mm) Minimum Design Thickness: 0.0158 inches (0.4013mm)

B. RUNNER CHANNELS: Provide 25 gauge galvanized channels with minimum 1-1/4 inch flanges with hemmed edges, in widths to accommodate stud sizes.

1. Non structural Track: Cold-Formed galvanized steel runner tracks, ClarkDietrick Building Systems ProTRAK drywall track in conformance with ASTM C645-09 for conditions indicated below:

a. Flange Size: 1 1/4 inch (32mm)

b. Web Depth: Track web to match stud web size.

c. Minimum Material Thickness: Track thickness to match wall stud thickness or as per design.

C. FURRING CHANNELS: Provide 20 gauge galvanized "hat" channels with face width of 1-1/4 inches, depth of 7/8 inches, and back Width of 2-9/16 inches minimum, hemmed edges.

D. CEILING SUSPENSION: Provide 16 gauge galvanized channels, 3/4" x 1/2" and 11/2" or 2" x 17/32".

1. Firestop tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; MaxTrak or an equivalent product.

2.3 ACCESSORIES

A. CORNER BEADS: 26 gauge galvanized beaded angle with 1-1/4" legs.

B. EDGE TRIM: 26 gauge galvanized steel "J" mould and angle with continuous bead. ClarkDietrich Building Systems 200.A and 200.B.

1. Channel Bridging and Bracing: Steel, 0.0538-inch (1.37mm) minimum base metal thickness, with minimum 1/2 inch (13mm) wide flanges.
   a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Spazzer 9200 Bridging and Spacing Bar, or an equivalent product.
   b. Depth: As indicated on drawings, 7/8 inch by 7/8 inch by 50 inches.

2. Backing Plate: Proprietary fire-resistance treated blocking and bracing in width indicated.
   a. Basis of Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Danback Fire-treated wood backing plate or an equivalent product.

C. WIRE: 9 gauge galvanized hanger wire and 16 gauge galvanized be wire.

D. SCREWS: Bugel head Type "S" self tapping drywall screws in lengths recommended by wallboard manufacturer. USG "Super-Tite".

E. CONTROL JOINTS: Roll formed zinc with 1/4" open joint, and perforated flanges. Provide with fireseal backing at rated systems. ClarkDietrich Building Systems No. 093.

F. JOINT ADHESIVE: Premixed water based compound. USG taping joint compound.

G. LAMINATING ADHESIVE: Durabond sheetrock setting-type for double-layer application and column fireproofing.

H. JOINT REINFORCING: Center creased paper tape equal to "Perf-A-Tape".

I. TROWELED FIRESTOPPING
1. System Type: A combination of glass fiber or mineral wool insulation packing material with troweled-on application of sealing compound.
2. Sealing Compound: Red tinted compound job mixed with water providing protection from heat (to temperatures of 1850 degrees F), smoke, toxic gas, fire and water. "Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop" as manufactured by National Gypsum Co. or approved equivalent by Domtar Gypsum, Inc.
3. Approvals:
   a. Rated as noncombustible as defined by NFPA Standard 220 when tested in accordance with ASTM E 136 at Underwriters Laboratories.
   b. Meet all requirements of ASTM E 814 and UL 1479: Fire tests of through penetration fire stops.

J. CORNER GUARDS: Textured Vinyl Corner Guards 3” by WallProtex. 4’ lengths, taped. Color as selected by Architect.

2.4 WALLBOARD

A. TYPICAL: 5/8" thick x 48" wide paper-faced gypsum panels, tapered long edges, lengths as required. U.L. listed and conforming to ASTM C-1396/C1396M-09a Standard Specification for Gypsum Board, Type X. USG fire code.

B. WATER RESISTANT: 5/8" thick x 48" wide U.L. listed, Type X board with chemically treated face paper and water resistant gypsum core. Comply with ASTM C-1396/C1396M-09a Standard Specification for Gypsum Board.

2.5 TILE BACKER BOARD

A. 5/8" thick cement board formed of aggregated Portland cement slurry with polymer-coated, glass-fiber mesh. "Durock" as manufactured by United States Gypsum Co or approved equivalent.

PART 3 - EXECUTION

3.1 PARTITION INSTALLATION

A. STUD SYSTEM ERECTION: Attach metal runners at floor and to structural elements with suitable fasteners spaced maximum 24" o.c. Position studs vertically, engaging floor track and runner at ceiling or structure. Place studs in direct contact with all door frame jambs, abutting partitions, partition corners and existing construction elements.

B. Anchor all studs adjacent to door and window frames, partition intersections, and corners to ceiling and floor runner flanges. Securely anchor studs to jamb and head anchor clips of door or side-light frames by screw attachment. Over door and side-light frames, install horizontal runner with a web-flange bend at each end, and secure with one positive attachment per flange.

C. Install diagonal stud bracing above ceiling at strike side of door jambs and at other locations as indicated in the drawings. Secure to structure.

D. Follow stud manufacturer's recommendations for all framing construction and fastening.

3.2 WALL PANEL ERECTION

A. Apply gypsum panels vertically or horizontally. Position all edges over studs for vertical application; all ends over studs for horizontal application. Use maximum practical lengths to eliminate end joints. Fit ends and edges closely together. Stagger joints on opposite side of partition.

B. For single-layer vertical application of gypsum panels, space screws 12" o.c. in field of panels and 8" o.c. staggered along vertical abutting edges. For horizontal panel application, space screws 12" o.c. in field and along abutting end joints.

C. For double-layer screw attachment, space screws 16" o.c. for both layers. Apply both layers of gypsum panels vertically with joints in face layer offset from base layer joints. For 5/8" panels, use 1 " screws for base layer and 1-5/8" screws for face layers. For 1/2" panels, use 7/8" screws for base layer and 1-5/16" screws for face layer.

3.3 CHASE WALL ERECTION

A. Align two parallel rows of floor and ceiling runners spaced as indicated in the drawings. Attach to concrete slabs with powder actuated anchors 24" o.c. and to suspended ceiling tees or structure with suitable fasteners 24" o.c.

B. Position metal studs vertically in runners, 16" o.c., with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor all studs to floor and ceiling runner flanges with U.S.G. Metal Lock Fastener tool.

C. Cut gypsum panel bracing to be placed between rows of studs, 12" high by chase wall width. Space braces 48" o.c. vertically and attach to stud webs with screw fasteners. 2-1/2" metal studs may be used in

lieu of gypsum panels. Anchor web at each end of metal brace to stud web with two 3/8" pan head screws.

3.4 CEILING FRAMING

A. GRILLAGE ERECTION: Space 8 gauge hanger wires 48" o.c. along carrying channels and within 6" of ends of carrying-channel runs. Wrap hanger around and through beams or joists. Install 1-1/2" carrying channels at 24" o.c. Position channels for proper ceiling height, level and secure with hanger wire saddle-bed along channel. Provide 1" clearance between runners and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to support. Overlap splices at least 8" and securely wire-fie each end with double-strand 16 gauge tie wire.

B. Erect metal furring channels at right angles to 1-1/2" carrying channels or main support members Space furring (16”) o.c. and within 6"of walls. Provide l" clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double strand 16 gauge be wire. Overlap splices at least 8" and securely wire-tie each end with double-strand 16 gauge fie wire.

C. At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.

D. At rated ceilings meet all requirements of selected U.L. Design No.

E. METAL STUD CEILING FRAMING OPTION: Attach runners at ceiling height through gypsum panels to each partition stud with two screws. Insert metal studs in runners and attach each end with one 3/8" pan head screw. Install 1-5/8" stud cross-bracing over stud framing, space 48" o.c. and attach to each framing stud with two 3/8" pan head screws. At hangers, install 12" long stud section for box reinforcing or lap studs 12" and secure each end with two 3/8" pan head screws. At light troffers or any openings that interrupt the ceiling, install additional cross reinforcing to maintain structural integrity of framing.

F. GYPSUM PANEL ERECTION: Apply gypsum panels of maximum practical length with long dimension at right angles to furring channels. Position end joints over channel web and stagger in adjacent rows. Fit ends and edges closely. Fasten panels to channels with 1 ", Type S screws, spaced 8" o.c. in field of panels and 8" along ends and edges.

3.5 EXTERIOR WALLS: Reference Section 05410.

3.6 ACOUSTICAL BATTS

A. Install unfaced full thickness acoustical fiberglass batts between studs at partitions as scheduled on the drawings. Fit batts tight to studs, tight to floor and head tracks and tight to one another. Batts shall run full height of partition unless indicated otherwise in the drawings.

3.7 ACOUSTICAL SEALANT

A. Install continuous bead of sealant at bottom tracks at drywall partitions.

B. Install vinyl foam double stick tape and sealant where head track terminates at ceiling.

C. See drawings for additional locations.

3.8 ACCESSORY APPLICATION

A. JOINT SYSTEM: Finish all face panel joints and corners with U.S.G. Joint System installed according to manufacturer's directions.
   1. Mix joint cement in strict accordance with manufacturers directions.
   2. Butter cement into joints filling them evenly and fully.
   3. Center tape and press down into cement leaving sufficient cement under tape for proper bond. Cover with thin coat of cement to fill recess between tape and board to bring material flush with surface.
   4. Face panels shall be cut fit around all wall outlets and switch boxes, utility lines, etc. All voids and cracks, occurring around all openings in board shall be taped and covered with joint cement.

B. LAMINATING ADHESIVE: Spread to provide 1/2" adhesive beads 4-1/2" o.c. for full sheet lamination. For strip lamination, apply adhesive in vertical strips of four 1/2" beads, 1-1/2" to 2" o.c. Space strips 24" o.c.

C. CORNER BEAD: Reinforce all vertical and horizontal exterior corners with corner bead fastened with 9/16" rosin-coated staples 9" o.c. on both flanges along entire length of bead.

D. METAL TRIM: At exposed edges of board or where board terminates against other materials, apply metal trim over panel edge and fasten with screws.

E. SCREWS: Power-drive at least 3/8" from edges or ends of panel to provide uniform dimple of 1/32" deep.

F. CONTROL JOINTS: Cut panel at joint and back with double framing members. Attach control joint to face layer with 9/16" rosin-coated staples spaced 6" o.c. on both flanges along entire length of joint. At rated walls, provide fireseal behind joint. Provide joints at 25' maximum or as otherwise indicated in the drawings.

G. CORNER GUARDS: Install as per manufacturer’s recommendations. Double sided adhesive tape factory applied to corner guard.

3.9 TROWELED FIRESTOPPING:

A. General: Install systems in complete accordance with manufacturers printed instructions and approved submittal for the required fire rating of the particular condition. Install firestopping systems at all penetrations and voids in all rated drywall ceilings and walls.

B. Through-penetrations. Ensure that pipe, conduit, duct, cables or other penetration element is rigidly supported by drywall framing on both sides of wall or ceiling assembly. Oversize opening in wall board to allow for required opening size and thickness of packing material in accordance with system and rating requirements. Install packing material in accordance with system requirements and compressed to allow for required thickness of sealing material. Trowel red-tint sealing material into void (same thickness as gypsum board) and smooth flush with both faces of drywall. Provide additional layer(s) of gypsum board around penetration where necessary to achieve required minimum thickness of sealing material.

C. Void-filling: For voids such as intersection of walls and smooth or corrugated deck, pack void with compressed packing material and trowel red-tint sealing material into void (same thickness as gypsum board) and smooth flush with both faces of drywall. Provide additional layer(s) of gypsum board around penetration where necessary to achieve required minimum thickness of sealing material.

3.10 WOOD BLOCKING: Coordinate with project carpenter to ensure installation of fire retardant wood blocking between studs for mounting casework, millwork, toilet partitions, drinking fountains and other equipment.

3.11 FINISHING SCHEDULE: Follow published "Recommended Specification: Levels of Gypsum Board Finish" as follows:

A. LEVEL 1 FINISH: At concealed areas above ceiling.

B. LEVEL 2 FINISH: At gypsum backing board to be covered with file or panels thicker than 1/4".

C. LEVEL 3 FINISH: At mechanical rooms, storage rooms, custodial and maintenance rooms, electrical and telephone closets.

D. LEVEL 4 FINISH: All other drywall areas scheduled for paint, fabric or vinyl wall covering.

END SECTION

SECTION 09300 — WALL AND FLOOR TILE

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install all ceramic wall and floor tile and base as indicated in the drawings and specified herein.

B. Provide and install all Saltillo tile flooring and base as indicated in the drawings and specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Cast-in-place concrete.

B. Drywall systems.

C. Masonry.

D. Waterproofing and dampproofing.

1.4 SUBMITTALS

A. Per SUPPLEMENTARY GENERAL CONDITIONS, submit samples, type of tile and color for Architect’s approval. Mark with manufacturer’s name and space where tile is to be installed.

B. Submit manufacturer’s printed literature describing products.

C. Submit (2) boxes of tile chips showing full range of available colors.

D. Submit (2) boxes of grout color samples.

E. Submit 12” x 12” grouted sample board for each tile/grout combination selected.

F. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to cracking, crazing, staining, joint spalling or cracking, loosening of bond.

1.6 QUALITY ASSURANCE

A. Tile Contractor shall have a minimum of 3 years experience in tile installation for projects of similar size and scope as this project.

B. Conform with all applicable requirements of the American Standards Association Specifications (A-108 Series) and the “Tile Handbook” of the Tile Council of America. Tile shall bear the seal of Tile Council of America, Inc., and be equal to or exceed Standard Grade.

1.7 DELIVERY & STORAGE

A. Deliver all manufactured materials in original, unbroken containers bearing name of manufacturer, brand and grade seal. Keep materials dry, clean and protected against deterioration in any form and at room temperature.

B. Maintain room temperature between 70 and 80 degrees F. 24 hours prior, during and a minimum of 48 hours after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. CERAMIC TILE:
1. American Olean
2. Dal-Tile
3. United States Ceramic Tile Co.

B. QUARRY TILE: American Olean, United States Ceramic Tile Co.

C. SALTILLO TILE:
1. Dal-Tile
2. Saltillo Tile USA, LLC

D. GROUT:
1. American Olean
2. Laticrete
3. Tex Rite

2.2 MATERIALS

A. GENERAL:
1. Saltillo Floor Tile: Glazed square saltillo tile to match existing.
a. Size: Nominal 12” x 12” (match existing size.)
b. Base: 4” high base (match existing size) provide bullnose plastic edge strip at top of all saltillo tile base.
c. Type: Square Saltillo Tile. Match existing.
d. Color(s): To match existing.

B. RESTROOMS/SHOWER ROOMS:
1. Floor Tile: Unglazed porcelain ceramic with cushioned edges and sheet backing.
a. Water absorption: Classified “Impervious” per A.S.T.M. C-373. Less than 1/2 of 1% absorption.
b. Size: Nominal 1” x 1” x 1/4" thick.
c. Base: 4” high base. Bottom tile with integral cove.
d. Type: Porcelain Tile in ***group 3*** as selected by the Architect from one of the specified manufacturers.
e. Color(s): Bidders shall assume a different color scheme for each room unless colors and patterns are indicated in the drawings.

2. Wall Tile: Glazed ceramic with cushion edges.
a. Size: Nominal 4” x 4” x 1/4" thick.
b. Base: See floor base.
c. Type: ***Group 1*** for field tile and for accent banding as selected by the Architect from one of the specified manufacturers.
d. Color(s): Bidders shall assume a different color scheme for each room unless colors and patterns are indicated in the drawings.

3. Trim: Terminate tile with bullnose edges and rounded outside corners. Provide square inside corners and at ceiling/wall joints.

C. THINSET BOND COAT: Latex/Portland Cement mortar mix meeting requirements of ANSI A118.4. Provide Portland cement and sand in a 1 to 1 mixture gauged with Laticrete 4237 latex additive. Use on dry cured mortar bed at slab recesses, where thinset on concrete slab, and where thinset on wall substrates.

D. SEALANT: One part silicone rubber meeting requirements of FS TT-S-001543, as manufactured by Dow Corning or General Electric.

E. GROUT:
1. Walls: Portland Cement waterproof, dry set grout as manufactured by American Olean. Color(s) as selected by Architect.
2. Floor and base: Interior grout shall be epoxy type as manufactured by American Olean. Color(s) as selected by Architect.

F. SEALANT: One part silicone rubber meeting requirements of FS TT-S-001543, as manufactured by Dow Corning or General Electric.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Examine surfaces to receive tile and do not start work until defects that will adversely affect tile work have been corrected.

B. Inspect all surfaces to see that they are dry, clean, free of oily or waxy film, firm, level and plumb. Report any unsatisfactory conditions to the Architect. Starting installation shall be deemed as acceptance of surfaces.

C. Do not start until work of other trades, which goes through or in the space behind tile has been completed. Do not proceed with installation until adjoining work is satisfactory protected. Close off spaces in which tile is being set to traffic and other work during installation and for at least 48 hours after completion of tile work.

D. Do not apply mortar and adhesives to surfaces covered by frost. Maintain minimum temperature-for installation of tile above 50 Deg. F. Prevent rapid evaporation of moisture from mortar bed. Do not set tile on dry bed.

E. Install specified mortar bed at slab depressions. Slope mortar bed uniformly to drain(s).

3.2 INSTALLATION

A. GENERAL: Tile shall be installed in accordance with current Tile Council of America's "Handbook for Ceramic Tile Installation", design numbers as indicated below.

B. Center fields and patterns on applied areas so that no tile is less than half size. For heights stated in feet and inches, maintain full courses to nearest attainable height without cutting tile.

C. Except where otherwise shown or specified, make joints in wall tile vertical and horizontal and joints in floor tile perpendicular and parallel to walls. Control joint widths of glazed tile by lugs on the sides of tile. Control joints widths between sheets of ceramic mosaic tile by supporting boards with metal spacing strips.

D. Grind and fit tile carefully at intersections, against trim finish and at built-in fixtures and accessories. Fit tile closely around outlets, pipes, fixtures and fittings so that plates, escutcheons and collars will overlap cuts. Cut and drill tile and trim shapes accurately without damage. Rub all exposed cut edges smooth with abrasive stone.

E. Coat trim with 1/32 to 1/16" pure coat paste. Set in same mortar mix as is recommended for setting flat tile on walls. Do not use pure coat as mortar to set trim and angles.

F. FLOORS:
1. Interior thinset on concrete floor slab:
   a. Tile bonded with minimum 3/32" thick latex-Portland cement bond coat over cleavage membrane adhered to floor slab (modified TCA F113).
   b. Adhere cleavage membrane to slabin strict accordance with manufacturer's recommendations using specified latex-Portland cement bond coat. Increase typical curing time of bond coat by 50%.
2. Interior thin-set on recessed mortar bed: Tile bonded with minimum 3/32" thick Latex-Portland Cement bond coat to reinforced mortar bed over loose bond breaker membrane over floor slab (TCA F111).

G. WALLS:
1. Ceramic Tile at Drywall Toilets: Thinset to water resistant gypsum wallboard.
2. Ceramic Tile at Drywall Showers: Thinset to tile backer board.

3. Ceramic Tile at Masonry: Bonded to mortar bed at masonry. No. **W211**.
4. 4" x 4" Porcelain – Over 3 ft. High Wainscot: Thinset over tile backer board.

H. EXPANSION JOINTS:
1. At floor tile provide 1/4" sealant expansion joints in accordance with TCA recommendations where tile abuts walls, curbs, columns and other restraining surfaces, where substrate material changes, at floor slab construction joints (cold joints), and each way in pattern approved by the Owner.
2. At walls install sealant expansion joints at inside corners, at maximum 30', and at other conditions subject to cracking or movement. Install specified sealant at expansion and control joints, at doorframe perimeters and similar conditions.

3.3 LAYOUT

A. Layout all work so that no tiles less than half size occur. Align all joints vertically and horizontally.

B. Cut and drill neatly without marring tile. Rub smooth any necessary cuts with a fine stone and set no cut edge against any fixture, cabinet, or other tile without a joint at least 1/16" wide.

C. Maximum plane variation shall be 1/8" + or – in 10' when a straight edge is laid on the surface in any direction.

3.4 GROUTING AND SEALING:

A. Follow grout manufacturer's recommendations for grouting procedures and precautions. Damp cure non-epoxy grout in accordance with manufacturer's recommendations.

B. Grout Haze Removal:
1. Unglazed Tile: For cement grout remove all grout haze following grout manufacturer's recommendations for use of acid and chemical cleaners. Rinse tilework thoroughly with clean water before and after chemical cleaners. Polish surface of tilework with soft cheesecloth.
2. Glazed Tile: For cement grout remove all grout haze with cheesecloth rub.
3. Take special care with epoxy grout to keep tiles clean as work progresses.

3.5 PROTECTION

A. Protect tiled floors from foot and wheel traffic for at least 7 days after installation.

B. Place plywood panels over traffic floors.

C. In non-traffic areas, cover floors with heavy paper taped in place.

D. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of tile installed.

END OF SECTION - 09300

SECTION 09512 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install all lay-in acoustical ceiling panels and suspended grid system in accordance with the drawings and as specified herein.

B. Provide and install light fixture protection at all rated ceilings.

C. Provide and install hold-down clips where required for rated system.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Steel joists (spacing)

B. Mechanical (air devices)

C. Electrical (lighting fixtures)

1.4 DRAWING REFERENCES

A. See drawings, finish schedule and Section 2.2 for ceiling types and ratings.

1.5 SUBMITTALS

A. Submit manufacturer's product data describing all materials, finishes, ratings and installation requirements.

B. Submit physical samples for each type of acoustical file proposed.

C. Submit physical samples for each type of grid proposed.

D. Submit tile manufacturer's certification for whether hold-down clips are required for the selected tile(s) and rated system(s).

E. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.6 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to rusting or deflection of grid, deterioration or deflection of acoustical tiles.

1.7 QUALITY ASSURANCE

A. Suspended acoustical ceiling contractor shall have a minimum of 3 years experience in the installation of specified systems for projects of similar size and scope of this project.

B. Installation of acoustical tile and panels shall not begin until residual moisture from plaster, drywall, concrete or terrazzo work is dissipated. Before installation, the building shall be enclosed and permanent heating and cooling equipment in operation.

1.8 DELIVERY AND STORAGE OF MATERIALS

A. Do not deliver materials to jobsite until spaces are ready for ceiling installation.

B. All materials shall be delivered in manufacturer's original packaging and stored in an enclosed shelter providing protection from damage and exposure to the elements.

C. Damaged, rusted or deteriorated materials shall be removed from the premises.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. TYPICAL CEILING PANELS:
1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.

B. GRID SYSTEMS:
1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.

2.2 MATERIALS:

A. TYPICAL CEILING PANELS:

1. 24" x 24" x 5/8" white **"Cortega Square Lay-in" No. 770**, square-edged as manufactured by Armstrong or equivalent (color, pattern, texture) by specified manufacturer. **Non-rated system.**

B. SUSPENSION SYSTEM:

1. Components shall be formed from commercial quality cold-rolled steel, electro-galvanized, 2'x2' module.

2. The suspension system shall support the ceiling assembly with a maximum deflection of 1/360 of the span per A.S.T.M. C-635-69.

3. Main tee with double web design 1-1/2" high and rectangular bulb; 15/16" exposed flange with rolled cap; cross tee holes at 6" o.c.

4. Four foot cross tee 1-1/2" high with double web design. Rectangular bulb joining main runners at 2' on center.

5. Two foot cross tees perpendicular to 4' cross tees. Two foot cross tees minimum of 1-1/2" high, No. CMC 222-41 or equivalent by specified manufactured.

6. Wall molding - hemmed edge, electro-galvanized cold rolled steel with equal leg width, finish to match grid.

7. Finish: Typical finish, factory white painted steel. At high humidity areas including dressing rooms, toilet rooms provide factory white painted aluminum cap.

8. Rating: Provide U.L. listed grid for scheduled system rating.

PART 3 – EXECUTION

3.1 COORDINATION

A. Verify that above ceiling work, including fire dampers, ductwork, piping, wiring and insulation is complete and approved prior to beginning ceiling work.

3.2 INSTALLATION

A. Ceiling systems shall be suspended from structural members by 12 gauge annealed wire; spacing as recommended by manufacturer. Provide additional support for light fixtures and grilles at each corner. Provide secondary support framing ("Unistrut") where spacing of structural members exceeds suspension system manufacturer's recommendations.

B. Acoustical lay-in panels shall be installed in strict accordance with the manufacturer's instructions. Tile shall be installed with fissures or pattern all in same direction.

C. Provide additional hangers at ceiling suspended items including projection screens, speakers, exit lights, air supply and return grilles.

D. Space main runner hangers a maximum of 6 inches from wall. Do not support systems from wall.

E. Adjust hangers to ensure level ceiling in plane.

3.3 RATED CEILINGS

A. Provide specified ceilings in fire rated assembly. Protect light fixture protection in accordance with approved U.L. Design to meet required assembly rating. Provide additional hangers to meet the requirements of the particular U.L. rating.

B. Ceiling system manufacturers not listed in the required U.L. design number (reference drawings) shall be responsible for determining whether their rated system is acceptable to the particular local code authority.

C. For ceiling tiles weighing 1 lb. per square foot or more, verify no requirement for hold-down clips at rated systems.

3.4 CLEANING AND REPLACEMENT

A. At completion, replace file unit and grid systems that are damaged. Clean or replace tile and grid systems that cannot be cleaned.

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of ceiling tile installed.

END OF SECTION

SECTION 09620 – SPECIALTY FLOORING

PART 1 GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. Section Includes: Rubber Floor Tile.

1.02 REFERENCED DOCUMENTS

A. ASTM International
1. D2859, Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
2. E662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. F373, Standard Test Method for Embossed Depth of Resilient Floor Coverings.
4. F386, Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces.
5. F511, Standard Test Method for Quality of Cut (Joint Tightness) of Resilient Floor Tile.
6. F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
7. F925, Standard Test Method for Resistance to Chemicals of Resilient Flooring.
8. F1344, Standard Specification for Rubber Floor Tile.
9. F1859, Standard Specification for Rubber Sheet Floor Covering Without Backing.
10. F2055, Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method.

B. Other Referenced Documents
1. National Fire Protection Association (NFPA) 255, Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
2. National Fire Protection Association (NFPA) 258, Test Method for Specific Density of Smoke Generated by Solid Materials.
3. FMVSS 302, Title 49, Part 571, Flammability of Interior Materials.
4. Title 16, CFR Chapter II, Subchapter D, Part 1630, Standard for the Surface Flammability of Carpets and Rugs (FF 70).

1.03 SUBMITTALS

A. Product Data: Submit product data, including manufacturer's specification summary sheet for specified products.

B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.
C. Samples: Submit selection and verification samples for finishes, colors, and textures.
D. Quality Assurance Submittals: Submit the following
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Manufacturer's Instructions: Manufacturer's installation and maintenance instructions.
E. Maintenance Information: Maintenance information for installed products in accordance with Division 1 sections.
   1. Methods for maintaining installed products.
   2. Precautions against cleaning materials and methods detrimental to finishes and performance.
F. Warranty: Warranty documents specified herein.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installing work similar to that required for this project.
B. Regulatory Requirements
   1. Fire Performance characteristics: Provide resilient rubber floor covering with the following Fire performance characteristics as determined by testing products in accordance with ASTM method (and NFPA method) indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. ASTM E648 (NFPA 253), Critical Radiant Flux of Floor Covering Systems; Class 1, Greater than 0.45 W/cm^2.
      b. ASTM E662 (NFPA 258), Specific Optical Density of Smoke Generated by Solid Materials; < 450.
C. Single-Source Responsibility: Obtain rubber floor tile and manufacturer’s recommended adhesive from a single supplier.
D. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, Manufacturer’s conditions, recommended adhesive depending on product, substrate type and type of installation, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with requirements in Division 1.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements in Division 1.
B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with Identification labels intact.
D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and acclimated to site conditions at temperature and humidity conditions recommended by manufacturer.

1.06 PROJECT CONDITIONS

A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive rubber flooring shall be clean, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature of 65º - 85º F for 48 hours prior to, during and thereafter installation of rubber flooring. Rubber flooring and adhesive shall be conditioned in the same manner. Rubber flooring/tile must be un-boxed at least 48 hours prior to installation in the areas in which it will be installed.
B. Existing Conditions: (Specify existing conditions affecting product use and installation).

1.07 SEQUENCING AND SCHEDULING

A. Finishing Operations: Install rubber flooring after finishing operations, including floor covering, painting and ceiling operations, have been completed.

1.08 MAINTENANCE

A. Extra Materials: Deliver to Owner five (5) percent extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1, Closeout Submittals Section.
B. Quantity: Furnish quantity of Rubber flooring equal to 5% of amount to be installed.
C. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.
D. Maintenance of finished floor covering to be conducted per Manufacturer’s Maintenance Guide.

1.09 WARRANTY

A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
   1. Warranty: 1 year limited warranty commencing on Date of Substantial Completion. Notice of any defect must be made in writing to manufacturer within 30 days after buyer learns of the defect.
   2. Limited Wear Warranty: 10 year limited wear warranty available depending on product type/design & type of use.

PART 2 PRODUCTS

2.01 RUBBER TILE FLOORING

A. Manufacturer: Flexco Corporation, 1401 E. 6th Street, Tuscumbia, AL 35674. Phone: 800-633-3151, Fax: 800-346-9075, Web: www.flexcofloors.com

B. Test results
   1. ASTM C1028, Static Coefficient of Friction (Slip Resistance); 0.88 dry
   2. ASTM D395, Compression Set; 12% or less
   3. ASTM D792, Density PCF; 65 lbs/cu/ft
   4. ASTM D2240, Hardness Shore A; 60 +/- 5
   5. ASTM D3389, (H-18 Wheels, 500 g/load, 1000 cycles) Taber Abrasion; < 0.50 grams weight loss
   6. ASTM D624, Die C, Tear Strength; 70 ppi
   7. ASTM F137, Flexibility; bends around a 6 mm mandrel with no cracks or breaks
   8. ASTM F925, Resistance to Chemicals; Passes, List available
   9. ASTM F970, Static Load Limit; 250 psi
   10. ASTM F1514, Resistance to Heat; Delta E: 2.24 and AATCC Gray Scale: 3.85 average

C. Product Warranty
   1. Manufacturer’s three year limited warranty for manufacturing defects
   2. Manufacturer’s ten year limited wear warranty

D. Products
   1. Flexco Prime Sports Flooring, homogeneous rubber product manufactured from Vulcanized post-industrial rubber color chips (EPDM) and vulcanized post-consumer tires, bonded with urethane binder.
      a. Color: To be selected by Architect from Manufacturer’s standard color selections.
      b. EPDM Chip Content Percentage: To be Selected by Architect.

c. Size:
1) Inter-locking tile (measured from outside tabs): 36” x 36” (914.4 mm x 914.4 mm) nominal
d. Thickness:
1) 1/2" (12.00mm)

E. Miscellaneous
1. Provide transition strips at any change of flooring material and/or height.

2.03 PRODUCT SUBSTITUTIONS

A. Substitutions: Permitted. Must submit proposed substitution in accordance with Section 01600. Approval to be determined by Architect.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s requirements as published in manufacturer’s installation instructions
B. Adhesive: Manufacturer’s brand adhesives, as required, based on product specified, job site conditions, subfloor type, and planned use of finished floor.

1. Section 2.01 Rubber Tile Flooring
a. Flexco 220 Sports Flooring Adhesive or approved equivalent by specified manufacturer.

3.02 EXAMINATION

A. Site Verification of Conditions: Confirm substrate conditions (which have been previously addressed under other sections) are acceptable for product installing in accordance with manufacturer's instructions.
B. Material Inspection: In accordance with manufacturer's installing requirements, visually inspect materials prior to installing. Material with visual defects shall not be installed.

3.03 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage while installing.
B. Substrate Preparation: Prepare substrate to be free of paint, old adhesive, sealers, coatings, finishes, dirt, film-forming curing compounds, or other substances which may affect the adhesion of floor covering to the substrate.
1. Concrete Substrate: Reference Standard ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. If the following test results exceed the floor covering manufacturer’s limits, installing shall not commence until results conform to limits.
a. Concrete Moisture Test: Per ASTM F1869 Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
1) Flexco 220 Sports Flooring Adhesive, 5 lbs or less
b. Concrete Moisture Test: Per ASTM F2170 Determining Relative Humidity in Concrete Floor Slabs using *in situ* Probes
1) Flexco 220 Sports Flooring Adhesive, 75% RH or less

c. Concrete pH Test: Perform pH tests on concrete regardless of its age or grade level or history of use. Readings below 7.0 and above 10.0 can adversely affect resilient flooring or adhesives, or both.

2. Do not install over existing floor covering or over substrates not approved by manufacturer.

3.04 INSTALLING

A. Refer to manufacturer's installation instructions for specific Rubber Flooring detailed specifications on installing.
   1. Flash Cove Procedure
      a. Follow manufacturer's recommended procedures for flash cove installation.
      b. Install Flexco #195 Cove Stick Filler at the wall and floor junction.
      c. Install Flexco #197 Resilient Cove Cap on the wall.
      d. Install metal inside and outside corners, to same height as cove cap.
      e. Butterfly corners can also be installed based on installer expertise.
   2. Finish Floor Covering Designs: As selected by Architect.
   3. Accessories: Architect shall specify manufacturers' color coordinated accessories as required, including (but not limited to) resilient wall base, stair nosing, reducers or other edgings, welding rods for heat welded seams.

3.05 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Upon Owner's request and with minimum 72 hours notice, provide manufacturer's field service consisting of product use recommendations and periodic site visits to confirm installing of product is in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of substantial completion.
B. No heat welding for first 48 hours.
C. Restrict foot traffic from new floor covering for first 48 hours.
D. Restrict furniture, fixtures and rolling traffic for first 72 hours.
E. Restrict cleaning/buffing for first 72 hours.

3.07 INITIAL MAINTENANCE PROCEDURES

A. General: Include in contract sum cost for initial maintenance procedures and execution by professional maintenance personnel after floor covering has been installed for 72 hours as specified in the manufacturer's maintenance instructions.

3.08 CLEANING

A. Cleaning: See manufacturer's maintenance instructions. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of.
B. Floor finishes: See manufacturer's product data information for information on floor finishes to be used.

END OF SECTION

SECTION 09650 – RESILIENT FLOORING AND BASE

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install all vinyl tile flooring as indicated in the drawings and specified herein.

B. Provide and install all resilient base as scheduled throughout the project, regardless of floor finish.

C. Provide and install all resilient transition strips at resilient flooring, steps, stairs and change of flooring materials.

D. Install tapered resilient transition edge strip at any place where resilient floor is installed on concrete steps/stairs and terminates with risers.

E. Provide five (5) coats of wax on all new resilient flooring.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Cast in place concrete.

B. Millwork.

1.4 SUBMITTALS

A. Submit manufacturer’s product data describing all materials.

B. Submit physical samples of all resilient materials to the Architect for approval. Color(s) to be selected by the Architect.

C. Submit manufacturer’s recommendations for finishing and maintenance of resilient flooring materials.

D. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to loss of adhesion, excessive surface wear, color change, curling or other deterioration.

1.6 DELIVERY, STORAGE AND HANDLING

A. Do not deliver flooring materials to the jobsite until spaces are ready for installation of resilient flooring.

B. Open material packages and acclimate flooring materials within the installation spaces for a minimum of 3 days prior to installation.

2 PART TWO – PRODUCTS

2.1 MANUFACTURERS

A. VINYL TILE:
1. Armstrong World Industries
2. Azrock Industries, Inc.
3. Johnsonite
4. Tarkett

B. RESILIENT BASE:
1. Roppe
2. Burke Flooring Products
3. Mercer Products Co., Inc.

2.2 MATERIALS

A. VINYL TILE: 12” x 12” x 1/8” Standard Excelon “Imperial Texture” vinyl composition tile, as manufactured by Armstrong World Industries, or equivalent in color and design by specified manufacturer.

B. RESILIENT BASE: 4” high x 1/8” thick x 4’ lengths, rubber cove base as manufactured by Roppe or equivalent by specified manufacturer. Color(s) to be selected by the Architect. Provide manufacturer’s pre-molded outside corners.

C. TRANSITION STRIPS: Vinyl transition strips as manufactured by Roppe or equivalent by specified manufacturer. Color(s) to be selected by the Architect.

3 PART THREE – EXECUTION

3.1 PREPARATION

A. Inspect the completed floor slab for defects which may adversely affect the finished resilient tile work. Commencing resilient flooring operations indicates acceptance of the sub-floor.

B. Subfloor depressions shall be brought to level with latex underlayment. Raised areas shall ground and smoothed prior to resilient flooring installation.

C. Thoroughly clean subfloor of all wax, oil, dusting, dirt or other deleterious material.

3.2 INSTALLATION

A. VINYL COMPOSITION TILE

1. Tile shall be installed in strict accordance with the manufacturer's recommendations using adhesive approved by tile manufacturer.
2. Unless otherwise indicated in the drawings, lay flooring with joints and seams aligned with building walls. Start laying tiles from the center of the room out for equal sized tiles at the perimeters. Avoid tiles of less than ½ size.
3. Spread adhesive using notched trowel. Apply only enough adhesive at one time to allow placing of tile prior to initial setting of adhesive.
4. Use heavy roller to smooth tile and ensure complete adhesion.
5. Install tapered resilient edge strip at any place where resilient floor meets concrete, carpet or other finish flooring material. Typically material changes should be made at the centerlines of doors. Color(s) as selected by the Architect.
6. Install tapered resilient transition edge strip at any place where resilient/wood flooring is installed on concrete steps/stairs and terminates with risers. Ensure a tight fit so resilient floor will not crack or be damaged by foot traffic. Color(s) and size as selected by the Architect.
7. Install tapered resilient transition edge strip at any place where there is a change of height and/or flooring materials.
8. A feature strip shall be used to divide any two areas where it is not possible to maintain alignment from one area to the adjoining area. Coordinate with Architect.
9. Scribe flooring to walls, columns, cabinets, floor outlets and other interruptions to ensure tight fitted joints.

B. RESILIENT BASE:

1. Install base using manufacturer's recommended adhesive applied with notched trowel. Install with contact cement within 6" of a job-formed outside corner.
2. Miter inside corners. Use factory-formed outside corners unless job-formed corners are specifically approved by the Architect.
3. Butt joints tight and scribe base to door frames, columns and other interruptions.

C. TRANSITION STRIP:

1. Subfloor must be smooth, sound, dry, clean, and free of dirt, wax, polish, paint, and all other foreign matter which may interfere in a good bond, including curing agents and sealers.
2. Carefully follow warnings on container of the Solvent-Based Contact Adhesive. Follow adhesive manufacturer's recommendations for the installation of TRANSITION STRIPS.
3. Roll TRANSITION STRIP with a hand roller.

3.3 CLEANING AND ADJUSTING

A. After installation all resilient flooring shall be cleaned and contractor shall provide five (5) coats of wax on all new resilient flooring.

B. Replace any damaged tile or tile that shows inconsistent shades of color/pattern. Remove glue stains or other marks.

C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of resilient flooring installed.

END OF SECTION 09650

SECTION 09680 – CARPET

PART 1 – GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 SUMMARY

A. Section Includes:
1. Carpet (broadloom).
2. 24x24 Carpet Tiles.
3. Accessories.

B. Related Documents: The Contract Documents, as defined in Section 01110 - 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. Section 01015 - Leeds Requirements & Leeds Matrix
2. Section 09650 - Resilient Flooring: Tile and base.
3. Section 14240 - Elevator: Elevator Cab floor finish.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM E 684 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

B. BOCA:
1. FF-1-70.

C. Carpet and Rug Institute (CRI):
1. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials.
2. Green label certification.

D. HUD:
1. UM44d Standards.

E. National Fire Protection Association (NFPA):
1. NFPA 253 - Test for Critical Radiant Flux of Floor Covering Systems.
2. NFPA 258 - Standard Research Test Method for Determining Smoke Generation of Solid Materials.

1.4 SYSTEM DESCRIPTION

A. Recycled content: minimum 50% total recycled content, with not less than 10% post consumer recycled materials and the balance post-industrial recycled materials.

B. Materials: all materials shall be high quality and of the type generally accepted for use in the industry. When used as intended, the materials shall be non-toxic, non-allergenic and free of similar health hazards. These materials include, but are not limited to, adhesives, cleaners, solvents, etc.

C. Recyclability: The carpet must be 100% recyclable.

D. Carpet shall inhibit the growth of fungi, gram-positive and gram-negative bacteria, in accordance with AATCC 138 or AATCC 174, parts 2 and 3. (Provide 3000 ppm of zinc OMADINE® bactericidefungicide.)

1.5 SUBMITTALS

A. Section 01340 - Submittal Procedures: Procedures for submittals.

1. Product Data: Data on specified products, describing physical characteristics and method of installation.
2. Shop Drawings: Indicate seaming plan, method of joining seams, and direction of carpet.
3. Samples: Submit two samples 13-1/2 inch x 18 inch in size illustrating color and texture.

B. Procedures for Closeout Submittals:

1. Include the following certifications:
    a. Stain proof certificate.
    b. No zippering certificate.
    c. Carpet and Rug Institute green label certification.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing work of this Section with minimum 5 years documented experience.

B. Regulatory Requirements:

1. NFPA 253 Critical Radiant Flux in Accordance with ASTM E 684: Class 1.
2. NFPA 258 NBS Smoke Chamber: Less than 450 flaming mode.
3. BCA flame spread classification: DOC FF-1(use group R-2 sprinklered).
3. HUD: UM44d Standards.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Adhesives: No adhesives to be used.

B. CRI “green label”.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver carpet in original mill wrappings with register number marked on each bale.

B. Storage areas shall be secure and dry with temperatures maintained above 65 degrees F at all times.

C. Remove carpet from its packaging and allow to acclimatize to area of installation 24 hours before application.

1.9 PROJECT CONDITIONS OR SITE CONDITIONS

A. Environmental Requirements: Do not install carpet unless a constant temperature of at least 65 degrees F. is maintained for 72 hours before, during and 48 hours after application in all areas to receive carpeting.

1.10 WARRANTY

A. Carpet Manufacturer's Warranty:

1. Submit a written Warranty, signed by carpet manufacturer and carpet installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship, including but not limited to the following:

   A. Delamination.
   B. Edge ravel.
   C. Wear.
   D. Tuft bind.

2. Warranty Period: 10 years.

1.11 MAINTENANCE

A. Maintenance Data: Maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with Project requirements, manufacturers offering Products which may be incorporated in the Work include the following:

CARPET TILES AND CARPET:

1. Mannington Commercial, Calhoun, GA. (800) 241-2262
2. Interface, LaGrange, GA. 800-336-0225
3. Mohawk Group, Marietta, GA. (800) 554-6637
4. Substitutions: Refer to Section 01600 – Substitution Procedures.

2.2 CARPET ACCESSORIES

A. Subfloor Filler: Latex underlayment, mixed with undiluted latex liquid furnished by the selected manufacturer. Use one of the following products.

1. Levelayer I, by Dayton Superior Corporation, Miamisburg, OH (800) 745-3700.

2. No. 345, by W.W. Henry Company, Orange, CA (800) 447-0216.

3. Approved Substitutions: Refer to Section 01600 – Products and Substitutions.

B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

C. Base Gripper: Tackless strip type with special lipped edge; color to match carpet.

D. Seam Adhesive: Recommended by manufacturer.

E. Rubber Transition and termination strips: Equal to Johnsonite Specialty Flooring Accessories, color to be selected by Architect

F. Adhesives: Materials must comply with the toxicity and emission limits specified in Article 1.3 above and with Section 01350.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Section 01700 - 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.

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.

3.2 PREPARATION

A. Prepare substrate for product installation in accordance with manufacturer's published instructions.

B. Subfloor ridges, bumps, and other irregularities. Fill cracks, contraction joints, holes, and depressions with subfloor filler as recommended by manufacturer to achieve smooth, flat hard surface.

C. Where carpet is installed on existing wood floors, carpet shall be installed directly on existing floors without underlayment.

D. If carpet is installed on concrete floors, apply subfloor filler and leveler to provide finished concrete surface smooth, with no more than 1/8 inch variation from plane within 10 feet in any direction. Prohibit traffic until subfloor filler is cured.

E. Remove old adhesive, paint, oils, waxes, sealers and curing compounds not compatible with adhesive to be used. Avoid organic solvents.

F. Vacuum clean substrate.

3.3 INSTALLATION

A. General Installation:

1. Install carpet and cushion in accordance with manufacturers instruction and CRI 104.

2. Verify carpet match before cutting to ensure minimal variation between dye lots.

3. Lay out carpet.

   A. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   B. Do not locate seams perpendicular through door openings.
   C. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   D. Locate change of color or pattern between rooms under door centerline.
   E. Provide monolithic color, pattern, and texture match within any one area.
   F. Extend carpet under removable flanges and furnishings and into alcoves and closets of each space.
   G. Provide cut outs where required and bind cut edges where not concealed by protective edge guards or overlapping flanges.
   H. Install with pattern parallel to walls and borders.

4. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance. Use power stretcher where carpet is greater in length than 20 feet.

5. Install carpet edge guard where edge of carpet is exposed and anchor guards.

6. Install carpet by trimming edges, butting cuts with seaming cement, and taping and/or sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet.

7. Trim edges and butt cuts with seam cement.

8. Carpet shall be installed directly on floor slab or wood floor with reusable hook/loop tape method using 3M TacFast or approved equal. Double sided tape is not acceptable.

B. Installation on Interior Steel Stairs:

1. Install tackless strips at back of treads, with pins facing riser, and at bottom of riser, with pins facing tread.

2. Install cushion on stair treads and lap over nosing.

3. Install carpet on stairs with the run of the pile in opposite direction of anticipated traffic to avoid peaking of backing at nosings.

4. Stretch carpet over stair treads, full width in one piece as indicated on plans. Fold carpet under 1 1/2 inches (4 cm) on each side.

3.4 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect carpet and base installation, seaming, pattern, layout, and attachment to substrate.

3.5 CLEANING AND PROTECTION

A. Comply with CRI 104, Section 15 - Protection of Indoor Installation, and manufacturer’s recommended

cleaning procedures and as follows.

B. Section 01700 - Execution Requirements: Cleaning and protection of installed work.

C. Vacuum carpet using commercial machine with face-beater element. Remove spots, according to manufacturer's recommendations, and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors. Final cleaning with HEPA vacuum as required by Section 01350.

D. Remove and recycle excess material as required by the Construction Waste Management Program, Section 01565.

3.6 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:

1. Temporary ventilation: As specified in Section 01150 - Environmental Procedures.

A. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of minimum 60 degrees F to maximum 90 degree F continuously for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Owner and Architect.

3.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color, pattern, and type of carpet installed.

END OF SECTION

SECTION 09910 – PAINTING AND FINISHING

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide all labor, materials, and equipment required for all painting, staining and finishing as indicated in the drawings, the approved submittals, and as specified herein. Painted or stained systems include but are not necessarily limited to the items listed below:

B. EXTERIOR SYSTEMS:

1. All visible wood unless noted otherwise.
2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes.
3. Exposed conduit, piping, etc., except for roof mounted piping not visible.
4. Exposed roof mounted equipment visible from ground level or from upper floors of the building.
5. All exposed concrete masonry units.
6. All items normally painted in accordance with good construction practice.

C. INTERIOR SYSTEMS:

1. All visible wood or behind cabinet doors unless noted otherwise.
2. All ferrous metal. All galvanized metal unless noted otherwise. Touch-up on welds or damaged finishes. Structural steel, steel joists and deck exposed to view except in mechanical rooms.
3. Exposed conduit, piping, outlet boxes, raceways, and panel boxes except galvanized or aluminum piping located in mechanical or electrical rooms.
4. All exposed concrete masonry units, gypsum board and plaster unless otherwise noted.
5. All factory-primed hardware. Back-priming of all wood trim, millwork or finished carpentry prior to installation.
6. All hollow metal doors and frames.
7. All items normally painted in accordance with good construction practice.
8. All unfinished louvers and grilles.

1.3 WORK TYPICALLY EXCLUDED

A. Shop applied primer on structural steel and miscellaneous metals items.

B. Aluminum frames, doors, and windows.

C. Plastic clad casework, millwork, and wall panels.

D. Factory finished equipment unless noted otherwise (provide job touch-up).

1.4 DRAWING REFERENCE: Reference any paint or finish notes in the drawings for any pre-selected colors or other requirements.

1.5 SUBMITTALS

A. Submit manufacturer's product data describing each proposed type of paint, sealer, stain, or coating and it's recommended use. Include viscosity and percent solids information. Where not the specified base manufacturer, list the specified brand name and type and the proposed substitute. The Architect shall be the sole judge as to equivalency of systems.

B. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.6 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of two years after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to peeling, crazing, cracking, blistering, mildewing, chalking or dusting, pin holes, color fade or loss of hardness or sheen.

1.7 QUALITY ASSURANCE

A. Painting contractor shall have a minimum of 5 years experience in the application of the specified systems for projects of similar size and scope as this project.

B. If requested by the Architect, provide system manufacturer's certification of the proposed painting contractor as approved for application of the product.

1.8 DELIVERY, STORAGE AND HANDLING

A. Do not deliver painting materials to the jobsite until spaces and surfaces are ready for painting.

B. Deliver materials in manufacturer's original containers, unopened except for shop mixing of colors. Containers shall bear manufacturer's readable labels indicating brand and type of paint. Any additional containers with labels indicating products not approved shall be removed form the jobsite. Any applied material not previously approved by the Architect is subject to removal and reapplication with the appropriate approved product.

C. Store materials in environmentally controlled area. Interior products shall be acclimated to a temperature range of 50-80 degrees F. at least 24 hours prior to application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. TYPICAL PAINTS: Systems are based on the first listed manufacturer. Only equivalent systems provided by specified manufacturers in accordance with attached Product Comparison sheet and as approved by the Architect are approved for use.

1. Sherwin Williams, Inc.
2. Pittsburgh Paints

B. SPECIALTY PAINTS:

1. Epoxies: Sherwin Williams, PPG, Pratt & Lambert.

C. SUBSTITUTIONS: In accordance with Section 01600 Substitution Procedures.

2.2 INTERIOR SYSTEMS

A. SYSTEM TYPES FOR NEW WALLS (Unless indicated otherwise on Finish Schedule or drawings):

1. Drywall in toilet rooms, storage rooms, and mechanical/electrical/toilet rooms/ classrooms: **Semi Gloss Enamel** at walls and ceilings.
2. Drywall soffits: **Eggshell Enamel**.
3. Typical masonry (CMU): **Gloss Enamel.**
4. Masonry (CMU) in toilet rooms: **Gloss Epoxy.**
5. Steel railings: **Gloss Aliphatic Urethane.**
6. Suspended rigging over open structure: **Dry Fog.**

B. SYSTEM DESCRIPTIONS (Reference item 3.3 for modifications and preparation required for these systems when applied to existing walls already painted):

1. Primer on gypsum board: SW PrepRite High Build Primer B28W601 – one coat over light to medium texture (submit texture sample for approval)
2. Eggshell Enamel on Drywall: SW Pro Mar 400 Latex Eg-Shel B20W4400 – one coat over specified primer.
3. Semi-Gloss Enamel on Drywall: SW Pro Mar 400 Latex Semi Gloss B31W4400 - one coat over specified primer.
4. Epoxy Paint on Drywall: One coat SW PrepRite 200 Latex Primer B28W200 over specified primer.
5. Gloss Enamel on Drywall: Two coats SW Water Based Catalyzed Epoxy B70 Series gloss acrylic over specified primer.
6. Semi-Gloss Enamel on shop-primed metals: SW Water Based Industrial Enamel B53-300 acrylic gloss Enamel – two coats.
7. Natural Finish on Wood: SW Sherwood BAC Wiping Stain (one coat) + SW Wood Classics Sanding Sealer B26V3 (one coat) + SW Wood Classics Satin Varnish A66.
8. Clear Finish on Wood: SW Wood Classics Polyurethane Varnish A67 (two coats). Sand lightly between all coats.
9. Block Filler: SW Prep Rite Block Filler B25W25 (for areas not subject to moisture); SW Heavy Duty Block Filler (for areas subject to moisture). Provide 2 coats as specified under “Execution”.
10. Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water based Industrial Enamel gloss acrylic latex over specified primer.

11. Semi-Gloss Enamel on CMU or concrete: Two coats block filler plus two coats SW Water Based Industrial Enamel semi-gloss acrylic latex over specified primer.
12. Semi-Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy semi-gloss over cured concrete plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
13. Gloss Epoxy Paint on CMU: Two coats block filler (unless surface-bonded) plus finish coat of gloss. Minimum paint thickness 3.0 dry mils.
14. Gloss Epoxy Paint on concrete: One coat SW Water Based Epoxy gloss over cured concrete plus finish coat of SW Water Based Epoxy gloss. Minimum paint thickness 3.0 dry mils.
15. Semi-Gloss Enamel on utility piping and galvanized metals: SW Pro-Cryl Universal Metal Primer – one coat + SW DTM Acrylic Semi Gloss – two coats.
16. Semi-Gloss Epoxy Paint on CMU: Two coats block filler plus finish coat of SW Water Based Epoxy semi-gloss. Minimum paint thickness 3.0 dry mils.
17. Gloss Aliphatic Urethane Enamel on primed steel railings: Over epoxy shop primer apply two coats SW Hydrogloss Single Component Water Based Urethane B65-181 Urethane Gloss Enamel using airless spray equipment.
18. Dry Fall Acrylic (exposed deck, structure and rigging): One coat SW Super Save Lite Acrylic Dry Fall Eggshell Primer & Finish. Black color. Overspray dries to non-adhering dust in a ten foot fall.

2.3 EXTERIOR SYSTEMS

A. SYSTEM TYPES:

1. Exterior Metals: **Gloss Enamel.**
2. Field welds: **Zinc-Rich Coating.**

B. SYSTEM DESCRIPTION:

1. Gloss Enamel on Galvanized Metals: SW Pro-Cryl Universal Metal Primer B66W310 (one coat) + SW Sher-Cryl HPA B66-300 enamel – two coats.
2. Block Filler on CMU: SW Heavy Duty Block Filler B24W46, one coat.
3. Gloss Enamel on Shop-Primed Metals: SW Sher-Cryl HPA B66-300 gloss enamel-two coats.
4. Gloss Enamel on Aluminum: SW Pro-Cryl Universal Metal Primer B66W310 – (one coat) + SW Sher-Cryl HPA B66-300 gloss enamel – two coats.
5. Field Welds: "ZRC" cold-applied galvanizing.

PART 3 - EXECUTION

3.1 PREPARATION

A. METALS: Remove grease, oil, and dirt. Touch-up any damaged primer with like material. Remove any welding tags and grind smooth before painting. Fill any open galvanizing ports.

B. PLASTER, CMU, CONCRETE: Remove dusting and mortar residue. Remove any efflorescence and seal. Ensure that plaster, concrete and mortar joints are dry and fully cured.

3.2 APPLICATION

A. GENERAL: All paint and finishes be brushed or sprayed in even, uniform coats without runs or sags. Allow each coat to dry completely before applying succeeding coats. All surfaces shall be dry and no painting shall be done in damp conditions or when the ambient temperature is below 50 degrees F.

B. WOOD DOORS: Factory sealed tops, bottoms, and edges of plastic laminate surfaced doors left undisturbed require no additional finishing. Reseal any job cuts. Paint metal glazing stops.

C. MECHANICAL/ELECTRICAL EQUIPMENT: Painting contractor shall examine the mechanical and electrical drawings to determine quantities and locations of exposed piping, louvers not shown in Architectural drawings, electrical and telephone panels in finished areas, exposed electrical conduit in finished areas.

D. BLOCK FILLER AT CMU: Apply **first coat** of filler to ensure penetration into voids and work into block texture with bristle brush. Follow with a **minimum of one additional coat.** Provide uniform finish with no pinholes.

E. DRYWALL: Paint finish, sheen and texture shall be uniform and match the samples submitted to and approved by the Architect.

3.3 PREPARATION OF EXISTING PAINTED SURFACES

A. Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease. Loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thoroughly washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

PART 4 – SCHEDULES

4.1 COLOR SELECTIONS

A. SCHEDULE: Unless colors are pre-selected in the Bidding Documents, the Architect shall prepare color schedule for the project using colors selected from the approved paint manufacturer(s). Where colors are pre-selected, the painting contractor shall use the colors selected or submit a schedule of proposed exact color matches by one of the specified paint manufacturers. **Provide 12” x 12” samples of actual paint for each color** whether pre-selected color or proposed color match.

B. DOCUMENTATION: Upon completion of the Project, painting contractor shall furnish to the Architect a complete schedule of paint brands, types, and colors actually used for each room and area.

4.2 EXTRA MATERIALS

B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Furnish quantity not less than 5 percent for each color (field and accent) of paint used.

END OF SECTION

SECTION 10110 – TACK BOARDS

PART 1 – GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. Perform all work required to complete the bulletin boards, and marker boards indicated by the Contract Documents and furnish all supplementary items necessary for its proper installation.

B. The requirements of Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements” of this Project Manual shall apply to all Work required for this Section.

1.02 SUBMITTALS

A. SAMPLES:
1. Submit for approval samples of typical accessories showing construction and finish specified.

B. SHOP DRAWINGS:
1. Submit manufacturer’s literature and mark sufficiently to indicate compliance with these specifications. Show locations, methods of supporting, methods of anchoring and finishes of each accessory.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Material manufacturer by any of the following manufacturers is acceptable, provided it complies with the Contract Documents.

1. Claridge Products and Equipment, Inc.
2. Newline

2.02 MATERIALS

A. TACKBOARDS: Fabri-cork tacking surface on 1/4” cork, 1/4” hardboard; overall 1/2” thick; wt. 2 1/2” lbs./sq. ft.; colors to be selected from manufacturer’s standard colors. Size: 4’ x 4’.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions and approved shop drawings. Install accessories plumb, square, level and true with wall or surfaces.

B. Frames of recessed accessories shall neatly trim the opening. Gaps and voids between frames and finished walls will not be allowed. Exposed and concealed fasting shall match finish or fixtures and shall be stainless steel, theft proof type.

C. Install concealed anchor plates to wall construction for mounting. Provide grounds or rough bucks, where required, to rigidly secure accessories.

3.02 CLEANING

A. Remove all manufacturer’s temporary labels or marks of identification. Clean and polish to remove all oil, grease, and foreign material. Leave in a neat, orderly and clean condition acceptable to the Architect.

END OF SECTION

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Provide and install **solid phenolic toilet partition system and urinal screens** as indicated in the drawings, the approved shop drawings and as specified herein.

B. Provide and install all toilet room and shower accessories as indicated in the drawings and as specified herein.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Wood blocking between studs.

B. Wall and floor finishes.

C. Electrical power provided.

1.4 SUBMITTALS

A. SOLID PHENOLIC PARTITION SYSTEMS:
1. Submit shop drawings for solid phenolic partition system indicating plan and elevation dimensions and mounting details. Submit hardware samples and full chain of melamine samples for partition doors.
2. Shop drawings indicating handicapped stall layouts not meeting State and Federal requirements will be returned and rejected without review.

B. ACCESSORIES:
1. Submit manufacturer’s product data describing size, type, finish and installation requirements for each item.
2. Indicate mounting heights for each item. Meet State and Federal requirements for the handicapped.

C. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to delamination of facing or edging, swelling of core, change in alignment of parts, failure of anchorage or fasteners.

C. Provide manufacturer's extended written warranty for systems and accessories where available.

1.6 QUALITY ASSURANCE

A. Partition system installation company shall have a minimum of 5 years experience in the installation of similar system for projects of similar size and scope.

B. Partition system installation company shall be authorized by the system manufacturer for this installation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver partition system materials to the job site in manufacturer's original packaging.

B. Store materials in covered, dry, temperature and humidity controlled space.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. SOLID PHENOLIC PARTITION SYSTEMS:
1. Bobrick Washroom Equipment
2. American Specialties, Inc.
3. Ampco

B. ACCESSORY MANUFACTURERS:
1. Bobrick Washroom Equipment
2. Bradley Wash Fountain Co.

C. PAPER TOWEL DISPENSERS:
1. Bobrick Washroom Equipment

2.2 TOILET ROOM ACCESSORIES:

1. Grab bars: Furnish and install grab bars at each handicapped toilet stall and showers. Bars shall be Bobrick No. B-6806 series, 1-1/2" outside diameter, satin finish stainless steel, configuration as indicated on the drawings, 1-1/2" clear to wall. **Where bars are mounted over back of toilet, General Contractor shall hold flush valve low.**

2. Mirrors: Mirrors shall be ¼" plate glass, mirror quality, with copper backs. Provide polished stainless steel or brass chrome plated frames in sizes indicated on the drawings.
   a. Tilted mirrors shall be Bobrick No. B-293 or equivalent by specified manufacturer.
   b. Flat mirrors shall be Bobrick No. B-290 or equivalent by specified manufacturer.

3. Mop Holder: Bobrick B223X24 stainless steel. Furnished and installed by Contractor.

4. Soap dispensers: Bobrick Contura Series Surface Mounted Soap Dispenser Model B-4112. Furnished and installed by Contractor.

5. Tissue dispensers: ClassicSeries Surface-Mounted Toilet Tissue Dispenser for Two Rolls Model B-265 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.

6. Paper Towel Dispensers: Recessed Paper Towel Dispenser and Waster Receptacle shall be Model B-369 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.

7. Shower Seats: Reversible folding handicap shower seat Model B-5181 of Bobrick Washroom Equipment, Inc. Furnished and installed by Contractor.

8. Clothes hooks: Surface mounted clothes hooks Model B-981 of Bobrick Washroom Equipment, Inc.

9. Soap Dish: Recessed soap dish Model B-4390 of Bobrick Washroom Equipment, Inc.

10. Towel Pin: Surface mounted towel pin Model B-677 of Bobrick Washroom Equipment, Inc.

11. Shower Rod: Model B-207 of Bobrick Washroom Equipment, Inc.

12. Shower Curtain & Hooks: Model B-204-1 and Model B-204-2 of Bobrick Washroom Equipment, Inc.

2.3 SOLID PHENOLIC PARTITION SYSTEMS:

A. STILES, PANELS, DOORS, SCREENS, BENCHES

1. Solid phenolic material constructed of solidly fused plastic laminate with matte-finish melamine surfaces, colored face sheets, and black phenolic-resin core that are integrally bonded. Edges shall be black. Brown edges shall not be acceptable. Color and pattern as selected by architect from manufacturer's standard colors.

2. Solid phenolic material shall meet National Fire Protection Association and International Build ing Code Interior Wall and Ceiling Finish Class A, Uniform Building Code Class I, ASTM E-84 Fire Resistance Standards; flame spread 20, smoke density 95.

3. Finish Thickness
   a. Stiles and doors shall be 3/4" (19mm).
   b. Panels and benches shall be 1/2" (13mm).

B. HARDWARE

1. All hardware to be 18-8, type-304 stainless steel with satin-finish.

2. All hardware shall be concealed inside compartments with the exception of outswing doors.

3. Hardware of chrome-plated "Zamak" is unacceptable.

C. LATCH

1. Sliding door latch shall be 16-gauge (1.6mm).

2. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.

3. Latch track shall be attached to door by flathead machine screws into factory installed threaded brass inserts.

4. Latch handle shall have rubber bumper to act as door stop.

5. Latch shall allow door to be lifted over 16-gauge (1.6mm) keeper for emergency access.

6. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.

D. HINGES

1. Cam shall be adjustable in the field to permit door to be fully closed or partially open when compartment is unoccupied.

2. Hinges shall be attached to door and stile by theft-resistant, one-way stainless steel machine screws into factory-installed metal inserts. Fasteners secured directly into the core are not acceptable.

3. Metal-to-metal connection shall withstand a direct pull of over 1,500 lb. per screw.

E. Clothes Hook shall be constructed of stainless steel and shall project no more than 1-1/8" (29mm) from face of door. Clothes hook shall be secured by theft-resistant, one-way stainless steel screws.

F. Mounting Brackets shall be constructed of stainless steel and shall be mounted inside compartment. Mounting brackets exposed on the exterior of the compartment will not be acceptable. Wall mounted urinal screen brackets shall be 11-gauge (3mm) double thickness.

G. Leveling Device shall be 3/16" (5mm) hot rolled steel bar; chromate-treated and zinc-plated; through bolted to base of solid phenolic stile.

H. Stile Shoe shall be one-piece, 4" (102mm) high, type-304, 22-gauge (0.8mm) stainless steel with satinfinish. Top shall have 90° return to stile. Patented one-piece shoe capable of adapting to 3/4" or 1" stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

I. Headrail (Overhead-Braced) shall be satin finish, extruded anodized aluminum (.065" / 1. 65mm thick) with anti-grip profile. Type: Floor mounted, overhead braced continuously over entire system.

PART 3 - EXECUTION

3.1 INSPECTION

A. Ensure that Contractor has properly installed solid wood blocking between studs at all mounting points.

3.2 INSTALLATION

A. Install accessories and partition systems in accordance with the project drawings, approved shop drawings and as specified herein. Use tamper proof stainless steel fasteners for all items.

B. ACCESSORIES:

1. Install through finished stud walls into solid wood blocking with stainless steel one-way screws. No plastic anchors.
2. Attach to masonry walls using stainless steel machine screws in lead shield anchors.

C. PARTITION SYSTEMS AND URINAL SCREENS:
1. Mount channels using stainless steel one-way screws through finished stud walls into solid wood blocking.
2. Mount channels to masonry walls using stainless steel machine screws in lead shield anchors.
3. Job measure for proper fit and to ensure that the maximum space between edge of any pilaster or panel and its adjacent surface is one inch.
4. Install pilaster, doors and panels plumb and square. Adjust doors for gravity closing.

D. FRAMED MIRRORS:
1. Mirrors shall be installed with theft-proof anchors at height shown on drawings. Furnish tilted mirrors where shown.
2. Install mirrors at other locations in addition to toilet rooms as indicated in the drawings.
3. Unframed mirrors are provided and installed under another section of these specifications.

END OF SECTION

SECTION 10350 - FLAGPOLES

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 specification section, apply to work of this section.

1.2 SESSION INCLUDES:

1.3 Aluminum flagpoles, ground mounted.

1.4 REFERENCES

A. AASHTO M246/M246M Standard Specification for steel sheet, metallic-coated and polymer pre-coated for corrugated steel pipes.
B. ASTM A53/A53M-02 Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
C. ASTM A123/A123M-02 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
D. ASTM A790/A790M-02 Standard Specification for Seamless and Welded Ferrite/Austenitic Stainless Steel Pipe
E. ASTM B221-02 Aluminum Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
F. ASTM B241/B241M-02 Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
G. CDA (Copper Development Association) - Handbook.

1.5 PERFORMANCE REQUIREMENTS

A. The General Contractor shall furnish and install a tapered aluminum flagpole, complete with a 50-star U.S. Flag and a State of Texas flag and all fittings, top ornament, lighting, ground spike with plate, foundation, grounding facilities, and all appurtenant work, all in accordance with the requirements of the Contract Documents.

1.6 SUBMITTALS

A. Submit under provisions of Section 01340.
B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements and imposed loads.
C. Product Data: Provide product data on pole, accessories and configurations.

1.7 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

1.8 QUALIFICATIONS

A. Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Texas. Provide calculations.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
C. Protect flagpole and accessories on site from damage or moisture.

PART 2 PRODUCTS

2.1 POLE MATERIALS

A. Aluminum: ASTM B241; 6063 alloy, T6 temper.

2.2 POLE CONFIGURATION

A. Nominal Height: 25 ft measured from nominal ground elevation.
B. Flagpole: Ground mounted type.
C. Flagpole Design: Cone tapered, seamless.
D. Halyard: External type.

2.3 COMPONENTS AND ACCESSORIES

A. Finial Ball: 6" diameter, spun aluminum.
B. Truck Assembly: Cast aluminum; revolving, stainless steel ball-bearings, non-fouling.
C. Flags: (1) U.S.A. design, 8 x 5 feet size, nylon fabric, brass grommets, hemmed edges.
(1) Texas design, 8 x 5 feet size, nylon fabric, brass grommets, hemmed edges.
D. Cleats: Aluminum with stainless steel fastenings, two per halyard.
E. Cleat Box: Aluminum with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.
F. Halyard: 3/8" diameter polypropylene, braided, white.

2.4 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M-246, corrugated 16-gage steel, galvanized.
B. Pole Base Attachment: Flush, aluminum base with base cover.
C. Lightning Ground Rod: Copper rod, 3/4" diameter; design length.

2.5 FINISHES

A. Metal Surfaces in Contact with Concrete: Asphaltic paint.
B. Concealed Steel Surfaces: Galvanized to ASTM A123 1.25 oz/sq ft.
C. Aluminum: Anodized to color as selected.
D. Finial: Spun and Lacquered.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.
B. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.3 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
B. Electrically ground flagpole installation.
C. Fill foundation tube sleeve with sand specified and compact.
D. Install foundation plate and centering wedges, welded base assembly for flagpoles base set on concrete base and fasten.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: One inch

3.5 ADJUSTING

A. Adjust work as needed.
B. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 10400 — GRAPHICS AND SIGNAGE

PART 1 - GENERAL

1.1 COORDINATION:

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.2 WORK INCLUDED

A. Material and installation for the Plastic Room Identification Plaques.

B. Material and Installation for Exterior/Interior Building Identification Letters.

C. Material and Installation For Building Dedication Plaque with logos and City Logo Cast Plaque (including but not limited to conversion of architectural drawings into useable vector line art format).

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Interior wall materials and finishes.

B. Exterior wall materials and finishes.

C. Typical handicapped site signage provided under Section 02580.

1.4 SUBMITTALS

A. Submit manufacturer’s product data describing materials, and mounting methods for Room Identification Plaques, Exterior/Interior Building Identification Letters, and Building Dedication Plaque.

B. Submit color samples of actual material for color and finish selection by Architect.

C. Submit finished sample of room identification plaque(s) with any required symbols other than text.

D. Submit paper “rubbing” of final layout of Building Dedication Plaque for Architect’s approval.

E. Submit full size paper layout of Exterior Building Identification Letters for each line of text.

F. Reference Section 01340 SUBMITTALS for additional submittal requirements.

1.5 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the work under this section for a period of one year after the date of Substantial Completion of the project.

B. Warranted defects shall include but not necessarily be limited to color fading, delamination, failure of anchoring or fastening, cracking, breaking or tarnishing.

C. Exterior signage or building letters contributing to streaking or staining of building shall be a defect to be corrected by the Contractor, with building materials cleaned or replaced as required.

1.6 QUALITY ASSURANCE

A. Fabrication and installation company shall have a minimum of 3 years experience in the installation of similar systems for projects of similar size and scope.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to the jobsite until surfaces are ready for installation of graphics.

B. Store materials in covered, dry, temperature and humidity controlled space.

2 PART TWO – PRODUCTS

2.1 MANUFACTURERS

A. ROOM IDENTIFICATION PLAQUES:
1. South Texas Graphic Specialties, Inc.
2. The Southwell Co.
3. Cantrell Industries.

B. EXTERIOR BUILDING IDENTIFICATION LETTERS:
1. A.R.K. Ramos
2. Gemini Inc.
3. Matthews Bronze Div. – Architectural Products
4. Metal Arts

C. BUILDING DEDICATION PLAQUE:
1. A.R.K. Ramos
2. Matthews Bronze Div. – Architectural Products
3. Metal Arts
4. OMC Industries, Inc.

2.2 MATERIALS

A. ROOM IDENTIFICATION PLAQUES:
1. 6” X 9” X ¼” thick two tone series:
2. Fabrication: Constructed of Wilson Art face laminate (as selected by the Architect from manufacturer’s standard selections) laminated to a solid acrylic core. The raised 1/32” acrylic copy

shall be cut through the laminate face color and chemically welded to the acrylic core to assure permanent attachment, including the symbols. Any lower and secondary copy shall be 5/8" high Helvetica Medium (all caps) incised copy paint filled. Colors as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable. The edge of the signs shall be finished to match the face laminate color-to-color as selected by the Architect.

3. At toilet rooms also provide with 2" high raised gender and wheelchair symbols when handicapped equipped noted on schedule. Symbols shall be chemically welded through the face laminate to the acrylic core. Edges painted a color as selected.
4. The raised copy shall be accompanied with grade 2 Braille by means of Visi Touch DuraDot Braille manufacturing system. The clear Glass DuraDot shall have a 0.059 surface diameter and raised 1/32" above the face laminate and shall be unitized to the acrylic core through the face laminate. The edges of the sign shall be finished to match the face laminate color-to color as selected by the Architect. Any secondary copy shall be 8-stroke computer engraved. Rounded corner letters will not be acceptable.
5. Installed plaques shall comply with all state, local, and federal requirements for compliance.

B. BUILDING DIRECTIONAL SIGNS:

1. 16" X 16" X ¼" thick two-tone series.
2. Fabrication shall consists of Wilson Art plastic laminate with an incised demarcation line paint filled with a color as selected. Face laminate to be laminated to an acrylic core. Edges and backside of sign to match when applied to glass to include back-up plate. Characters shall be raised acrylic copy chemically welded through the laminate to the acrylic core to assure a permanent attachment of copy and symbols. Colors as selected by the Architect from laminate manufacturer's full range.
3. Include Braille notations.
4. Symbols shall be chemically welded through the face laminate to the acrylic core. Edges painted a color as selected.
5. Submit six (6) building directional signs as base bid unless noted otherwise on drawings.

C. EXTERIOR & INTERIOR BUILDING IDENTIFICATION LETTERS

1. Scope: The project shall include a cast letters as described below, to be provided and installed by contractor. Letterstyle, finish and mounting to be selected by Architect.

2. Fabrication of Letters: Fabricate letters to comply with requirements indicated below and as indicated on drawings.

   A. Cut letters: Form letters by cutting from solid sheet material of thickness specified. Produce characters with smooth flat faces, sharp corners, precisely formed lines and profiles, free from pits, scale, sand holes and other defects. Supply anchoring devices on reverse side of individual letters as required.

3. Characteristics:
   A. Metal: Aluminum
   B. Size: 8", 10" and 12" (Refer to drawings).
   C. Thickness: 1 1/2 inches.
   D. Letterstyle: Helvetica Med.
   E. Finish: As selected by Architect from manufacturer's finish options (submit samples).
   F. Mounting: Concealed (refer to drawings for wall type).
   G. Text: As indicated on drawings.
   H. Address: Provide additional 10" lettering for project street address.

4. Template: Provide full size paper mounting template showing hole placement and location of mounting holes.

5. Finishes: Colors and surface textures for exposed letters as selected by the architect from the manufacturer's standard and ***premium*** selections.

D. BUILDING IDENTIFICATION PLAQUE:

1. 18" wide X 24" high cast bronze alloy plaque. Borders and raised text shall have satin finish. Background shall receive a dark oxidized leatherette finish. Faces and edges to be chemically cleaned and sprayed with two coats of clear acrylic lacquer.

2. Provide threaded stainless steel or brass studs on back for concealed mounting with epoxy. Letter style "Helvetica Medium" per A.R. Ramos or equivalent by specified manufacturer.

3. Layout, logos and letter sizes to be provided by the Architect. General contractor shall perform all conversions of architectural drawings & logos into useable vector line art format or any other type of format as required in order to produce the building plaque layout as provided by the Architect.

E. CITY LOGO CAST PLAQUE:

4. 24" diameter, cast aluminum plaque. Borders and raised text shall be a painted finish (face & edges) Colors as selected by Architect. Background shall be painted finish with a stipple texture. Faces and edges to be chemically cleaned and sprayed with two coats of clear acrylic lacquer.

5. Provide threaded stainless steel or brass studs on back for concealed mounting with epoxy. Letter style "Helvetica Medium" per A.R. Ramos or equivalent by specified manufacturer.

6. Layout, logos and letter sizes to be provided by the Architect. General contractor shall perform all conversions of architectural drawings & logos into useable vector line art format or any other type of format as required in order to produce the city logo cast plaque layout as provided by the Architect.

3 PART THREE- EXECUTION

3.1 INSPECTION AND PREPARATION

A. Ensure that wall surfaces are completed and accepted by the Architect prior to installing wall-mounted items or painted wall graphics.

B. Obtain approved location schedule for Room Identification Plaques prior to delivery of plaques to the jobsite.

3.2 INSTALLATION

A. ROOM IDENTIFICATION PLAQUES:

1. Apply top and bottom strips of 1/8" thick double stick vinyl foam tape and backs of each plaque. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of plaque.

2. Plaques shall be mounted to the strike side of the door on the wall within 5’ of the floor and 6” max. from the jamb; when location is on a glass side light or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

B. BUILDING DIRECTIONALS SIGNS:

1. Apply top and bottom strips 1/8” thick double stick vinyl foam tape on backs of each sign. Apply liberal amount of clear silicone rubber adhesive to a minimum of 50% coverage of back of sign.

2. Signs shall be mounted to the strike side of the door on the wall within 5’ of the floor and 6” max. from the jamb; when location is a glass sidelight or window, mount with a solid color back-up plate to cover reverse side of the glass. Attachment shall be with foam tape and silicone.

C. EXTERIOR/INTERIOR BUILDING IDENTIFICATION LETTERS.

1. Pre-drill holes into masonry and insert threaded stud on back of letters into epoxy adhesive filled holes. Provide stainless steel spaces to set letters off wall ½” minimum 2 studs per letter. Refer to drawings for wall finish type.

D. BUILDING IDENTIFICATION PLAQUE & CITY LOGO CAST PLAQUE:

1. Masonry Wall: Pre-drill holes into masonry walls and insert threaded studs on back of letters into epoxy adhesive filled holes. Mount plaque tight against wall.

2. Drywall: Mount plaque using a minimum of 4 moly type expansion screws and silicone adhesive. Mount plaque tight against wall.

END OF SECTION

SECTION 10500 – METAL LOCKERS

PART 1- GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 SCOPE:

A. Furnish and install new steel lockers, accessories and finish metal trim as shown or indicated on approved drawings. Provide concrete or masonry bases, wood furring, blocking or trim as required for a complete installation.

B. Furnish and install at least two (2) ADA compliant steel lockers meeting the Texas Accessibility Standards 2012 latest revision.

1.2 SUBMITTALS:

A. Shop Drawings: Submit drawings showing locker types, sizes and quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces.

B. Numbering: The locker numbering sequence shall be provided by the approving authority and noted on approved drawings returned to the locker contractor.

C. Color Charts: Provide color charts showing manufacturer's available colors. If required by normal office procedures or in the event of non-standard color selection, request samples of paint on metal.

D. Lock Combination Listings and Master Keys: Use only when combination locks are specified. Delivered directly to the owner's representative.

1.3 QUALITY ASSURANCE:

A. UNIFORMITY: Provide each type of metal locker as produced by a single manufacturer, including necessary accessories, fittings and fasteners.

B. JOB CONDITIONS: Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage and installation.

PART 2- PRODUCTS

2.1 MANUFACTURER:

A. Republic Storage Systems, LLC.

B. Substitutions: In accordance with Section 01600.

2.2 LOCKERS:

A. Configuration: ***Ultra-Frame Single Tier***
Size: ***18"W X 24"D X 72"H***
Color: To be Selected by Architect.

2.3 FABRICATION:

A. MATERIAL: All major steel parts shall be made of mild cold rolled steel, free from imperfections and capable of taking a high grade enamel finish. Framing components shall be made of 1-inch by 1-inch by 1/8-inch steel angle iron.

B. FINISH: Surfaces of the steel shall be thoroughly cleaned and phosphatized in a seven-stage process. All parts shall then be finished with a heavy coat of enamel baked on at 300 degrees for 30 minutes.

C. CONSTRUCTION: Lockers to be welded at seams and joints with exposed welds sanded smooth. No bolts, screws, or rivets to be used in assembly of locker units. Ship lockers set-up, ready to be anchored in place in accordance with manufacturer's instructions. Lockers shall be welded into groups as wide as practical for painting and handling.

D. LOCKER BODIES
   A. Side panels and intermediate partitions (uprights) shall be constructed of formed 16 gauge sheet steel, framed on all four sides by 1-inch by 1-inch by 1/8-inch steel angle iron, welded to make a rigid frame. The formations on this panel shall also provide the frame necessary around door opening. Hinges and latching components shall be welded to this framing. A continuous vertical door strike integral with the frame shall be on both sides of the door opening. Angle iron framing shall not be visible from outside of locker. Ventilation shall be provided by diamond shaped perforations 3/4" wide by 1-1/2" high on locker sides. Uprights are also available without perforations for use as end panels.
   B. Backs shall be constructed of 18 gauge cold rolled sheet steel welded to the frames of side and intermediate partitions.

   C. Tops and bottoms shall be constructed of 16 gauge cold rolled sheet steel with a single panel spanning across a welded group of lockers. Top and bottom shall be welded to the frames of side and intermediate partitions.

   D. Shelves and tier dividers shall be constructed of 16 gauge cold rolled sheet steel welded to the side and intermediate partitions. Shelves shall be provided in lockers taller than 42", located about 12" down from top of locker. Double, triple and four tier lockers shall have a channel shaped cross frame provided between the upper and lower doors.

E. DOORS: Single, double, and triple tier doors shall be formed from one piece 14 gauge cold rolled sheet steel. Formations shall consist of a full channel shape on the lock side of adequate depth to fully conceal the lock bar, channel formation on the hinge side and right angle formations across the top and bottom. Doors shall have diamond shaped perforations 3/4" wide by 1-1/2" high in a vertical band on the right side of the door to provide free airflow, while leaving sufficient metal for rigidity and strength, and keeping diamond perforations a secure distance from the latching mechanism. On doors 15” and wider, tiered athletic doors shall be reinforced with a 16 gauge channel welded to the inside side of the door. Channel shall be 7/8" wide and shall be placed vertically in the center of the door to provide maximum stiffness.

Doors for box lockers 5 and 6 openings high to be 14 gauge formed steel with right angle flanges on all four sides. Box locker doors are perforated for free airflow using small diamond perforations 7/16"wide by 15/16" high. Box locker doors are punched to accept optional strike plate.

F. PRE-LOCKING DEVICE: Unless an optional latching is chosen, all "tiered" lockers, shall be equipped with a positive automatic pre-locking device whereby the locker may be locked while door is open and then closed without unlocking and without damaging locking mechanism.

G. LATCHING: Latching shall be a one-piece, pre-lubricated spring steel latch, completely contained within the lock bar under tension to provide rattle-free operation. The lock bar shall be of pre-coated, double-channel steel construction. The lock bar shall be securely contained in the door channel by self-lubricating polyethylene guides that isolate the lock bar from metal to metal contact with the door. There shall be three latching points for lockers over 42" in height and two latching points for all tiered lockers 42" and under in height. The lock bar travel is limited by contacting resilient high-quality elastomeric cushioning devices concealed inside the lock bar. Frame hooks to accept latching shall be of heavy gauge steel, set close in and welded to the door frame. Continuous vertical door strike shall protect frame hooks from door slam damage. The impact caused by the door closing shall be absorbed by a soft rubber silencer which is to be securely installed on each frame hook. A Latch Guard steel plate shall be welded on each frame hook on tiered lockers.

H. HANDLES - Tiered Lockers: A non-protruding 14 gauge lifting trigger and slide plate shall transfer the lifting force for actuating the lock bar when opening the door. The exposed portion of the lifting trigger shall be encased in a molded ABS thermoplastic cover that provides isolation from metal-to-metal contact and be contained in a formed 20 gauge stainless steel pocket. This stainless steel pocket shall contain a recessed area for the various lock types available and a mounting area for the number plate.

I. HINGES: Hinges to be 3 inch, five knuckle, 14 gauge with 3/16 diameter pin, securely welded to both the door and the frame. Locker doors 42" high and less shall have two hinges. Doors over 42" shall have three hinges.

J. INTERIOR EQUIPMENT: Single tier lockers over 42" high shall have one hat/book shelf. Other tiered lockers do not require shelves. All single and double tier lockers shall have one double prong rear hook and two single prong side hooks in each compartment. All hooks shall be made of steel, formed with ball points, zinc-plated and attached with two rivets. Lockers under 30" high are not equipped with hooks although holes are provided if the user chooses to add hooks to smaller lockers.

K. BASE: Integral base securely welded to the locker. Integral base to be constructed of 14 gauge cold rolled sheet steel. It is 4 inches high, the width spanning across the welded group of lockers, enclosing all four sides.

L. SLOPING TOPS, TRIM, FILLER PANELS: ULTRA-Frame Lockers are compatible with Republic’s Continuous Sloping Tops. These can be formed of 20 or 16 gauge cold rolled sheet

steel, sloping back at 18 degrees, supplied with necessary end and corner panels. ULTRA-Frame Lockers are also compatible with Republic's recessed trim, slip joints, angle fillers, and boxed end panels. All of these solutions assemble to the lockers using concealed fasteners.

M. NUMBER PLATES: Each locker shall have a polished aluminum number plate with black numerals not less than 1/2" high. Plates shall be attached with rivets to the lower surface within the recessed handle pocket. On doors equipped with single point latching, plates shall be attached with rivets to the top face of the locker door for high visibility.

N. COLOR: Doors and body parts to be finished in colors selected from Republic's collection of twenty-five colors.

PART 3- EXECUTION

A. INSTALLATION: Lockers must be installed in accordance with manufacturer's approved drawings and assembly instructions. Installation shall be level and plumb with flush surfaces and rigid attachment to anchoring surfaces. Space fasteners at 36" O.C. or less as recommended by manufacturer. Use fasteners appropriate to load and anchoring substratum. Use reinforcing plates wherever fasteners could distort metal. Various trim accessories where shown, such as sloping tops, fillers, bases, recess trim, etc., shall be installed using concealed fasteners. Flush, hairline joints are provided at all abutting trim parts and at adjoining surfaces.

B. ADJUSTMENT: Upon completion of installation, inspect lockers and adjust as necessary for proper door and locking mechanism operation. Touch up scratches and abrasions to match original finish.

END OF SECTION

SECTION 10501 — HARDWOOD LOCKER BENCHES

PART 1 - GENERAL

1.1 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.2 DESCRIPTION

A. Hardwood bench work includes the following, where indicated:
1. Hardwood Locker Room Benches.
2. ADA Compliant Hardwood Benches.

B. Furnish all labor and materials necessary for the completion of work in this section as shown on the contract drawings and specified herein.

C. Work in this section shall include, but is not limited to:
1. Locker room benches and steel, or aluminum pedestals.
2. Hardware for locker room benches and pedestals.
3. Manufacturer’s guarantee.

D. Related work specified elsewhere shall include accessories and anchorage/blocking for attachment of locker room benches.

1.3 PRODUCT

A. Submit six (6) sets of shop drawings and details for architect’s approval.

B. Colors shall be selected from the manufacturer’s full range of colors: REPUBLIC STANDARD COLORS; or approved equal.

C. Color samples and hardware samples shall be submitted for approval by the architect upon request.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Locker room benches and pedestals to be supplied by REPUBLIC STORAGE SYSTEM Co., or approved equal.

2.2 MATERIALS

A. Locker room bench tops shall be 9-1/2” wide x 1-1/4" full finish thickness laminated maple. Benches and pedestals shall have an overall height of 17-1/2”. All Bench tops are to be maple laminated. Locker room bench tops shall be fabricated from polymer resins compounded under high pressure, forming a single component section which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. All plastic components shall be covered with a protective plastic masking.

B. ADA Compliant Bench: ADA compliant bench tops are to be 48” wide and 24” deep max, laminated maple, 1-1/4" full finished thickness. All corners are to be rounded and sanded. Top and edges have two coats of a clear finish with one coat on the bottom. Four pedestals required. Benches shall have an overall height of 17-1/2”.

2.3 CONSTRUCTION

A. Standard locker room bench tops shall be 1-1/2" thick with all edges rounded to a 1/4" radius. Standard bench top size is 9-1/2" wide by customer specified length not to exceed 96" for a single piece. ADA compliant bench tops are to be 48” wide and 24” deep max.

2.4 HARDWARE

A. Standard pedestals shall be 16-1/4" high, and secured to bench tops with stainless steel, torx screws and secured to the floor using lead expansion shields and stainless steel, phillips head screws. Pedestal consist of sturdy 1-1/4” outside diameter tubing with 10 gauge steel flanges.

B. Moveable Pedestal shall be a freestanding trapezoidal-shaped 16” high, with a 1/4" x 3” aluminum bar stock and feature a black anodized finish. Non-skid pads shall be provided for each pedestal.

C. Pedestal spacing not to exceed 4’ on center.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine areas to receive locker room benches for anchorage/blocking that may affect installation of benches. Report any discrepancies to the architect.

B. Take complete and accurate measurements of locations to receive locker room benches.

C. Start of work constitutes acceptance of job.

3.2 INSTALLATION

A. Install locker room benches in a rigid, straight, plumb and level manner, with plastic laid out as shown on shop drawings and manufacturer's installation instructions.

B. No evidence of cutting, drilling and/or patching shall be visible on the finished work.

C. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

3.3 WARRANTY

A. Provide written warranty against defects in materials and workmanship for the Work under this section for a period of one year after the date of Substantial Completion of the Project.

B. Warranted defects shall include but not necessarily be limited to deterioration of finish, corrosion, faulty latch or lock operation, loosening of anchorage, failure of rivets or other fastenings.

END OF SECTION

SECTION 10523 - FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED SECTIONS

A. Section 04220 – Concrete Masonry Units; CMU walls to receive bracket mounted fire extinguisher.

B. Section 06100 – Rough Carpentry: Wood blocking and framing to receive semi-recessed fire extinguisher cabinets.

C. Section 09250 – Gypsum Drywall Assemblies: Finished openings in walls for semi-recessed fire extinguisher cabinets.

1.03 REFERENCES

A. NFPA 10 – Standard for Portable Fire Extinguishers; National Fire Protection Association; 2002.

B. UL (FPED) – Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.05 SUBMITTALS

A. See Section 01340 – Submittals, procedures and requirements for shop drawings, product data and submittal requirements.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
1. JL Industries, Inc; Product 1037B20 with Extinguisher: www.jlindustires.com.
2. Larsen's Manufacturing Co: www.larsensmfg.com.
3. Potter-Roemer: www.potterroemer.com.
4. Substitutions: See Section 01600 – Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Basis of Design: JL Industries, "Cosmic 10E".
B. Type: Multipurpose dry chemical.
C. Rating: Sized for project requirements.
D. Mounting: Refer to floor plans for locations, annotated FEC for cabinets and FE extinguishers alone.
E. Dry Chemical Type: Stainless steel tank, with pressure gage.
1. Class A:B:C.
2. Size 10.
3. Finish: Baked enamel, Red color.

G. ALL fire extinguishers shall be inspected and certified by the local authority having jurisdiction that they are charged and ready for use and shall be "tagged" identifying such.

2.03 FIRE EXTINGUISHER CABINETS

A. Basis of Design:
1. JL Industries, "Cosmopolitan – 1035B20 ADAC with Saf-T-Loc, TAS compliant.

2. Designations: Refer to the floor plans, FEC for Extinguishers in cabinets and FE for surface mounted extinguishers secured to walls.

B. Surface Mounted (Non-Cabinet, FE Type) – Bracket and Extinguisher (non-cabinet): Manufacturer's standard stainless steel strap with enamel finished bracket with locking band retainer.
1. Bracket shall match the extinguisher type.

C. Metal for Cabinets: Formed stainless steel sheet; 0.036 inch thick base metal; #4 finish stainless steel.

D. Cabinet Configuration: Recessed type.

1. Sized to accommodate accessories.
2. Exterior nominal dimensions of 13 7/8 inch wide x 27 3/8 inch high x 6 inch deep.
3. Trim: Returned to wall surface, with 3 inch projection, 1 1/2 inch wide face.
4. Form cabinet enclosure with right angle inside corners and seams. Form perimeters trim and door stiles.

E. Door: 0.036 inch thick, reinforced for flatness and rigidity; lock with full glass access. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

F. Door Glazing: Glass, clear, 1/8 inch thick float. Set in resilient channel gasket glazing.

G. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

H. Weld, fill, and grind components smooth.

I. Finish of Cabinet Interior: Enamel, color to select from manufacturer's full color line.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: FIRE EXTINGUISHER, vertical up face of cabinet to one side.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install cabinets plumb and level in wall openings, 30 inches from finished floor to inside bottom of cabinet.
C. Secure rigidly in place.
D. Place extinguishers in cabinets.

END OF SECTION

SECTION 11190 - DETENTION SECURITY HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 SUMMARY

A. This Section includes hollow metal detention security products as specified and as shown in the contract drawings.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Hollow metal detention security doors with 3 hour, 1 1/2 hour, 3/4 hour, 1/3 hour fire rating.

B. Doors shall include glass moldings, stops, and food pass openings as shown in the schedule, on the contract drawings and specified herein.

C. Hollow metal detention security frames for 3 hour, 1 1/2 hour, 3/4 hour, 1/3 hour fire rating with anchors.

D. Frames shall include glass molding and stops, steel plate inserts, pass thru devices as shown in the schedule, on the contract drawings and specified herein.

E. Hollow metal detention security panels similar in construction to the detention security doors.

1.03 RELATED PRODUCTS FURNISHED BY OTHERS BUT NOT SPECIFIED IN THIS SECTION

A. Door Hardware

B. Security Glass and Glazing Materials

1.4 RELATED SECTIONS

Related sections are not the responsibility of the hollow metal manufacturer.

A. Section 03300 - Cast in Place Concrete: Item(s)

B. Section 03345 - Concrete Floor Finishing: Item(s)

C. Section 03400 - Precast Concrete: Item(s)

D. Section 04200 - Masonry System; Item(s)

E. Section 05120 - Structural Steel: Item(s)

F. Section 09900 - Painting: Item(s)

G. Section 11190 - Detention Locking Control Systems: Item(s)

1.05 REFERENCES

A. ASTM A167-99 (2009) Standard Specifications for Stainless and Heat Resisting Chromium – Nickel Steel Plate, Sheet and Strip, Type 300 Series.

B. ASTM A653/A653M-09a Specifications for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dipped Process, Commercial Quality.

C. ASTM A1008/A1008M-10 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Allow with Improved Formability, Solution Hardened, and Bake Hardenable.

D. ASTM A1011/A1011M-10 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

E. ASTM B117-09 Method of Salt Spray (Fog) Testing.

F. ASTM C143/C143M-10 Standard Test Method for Slump of Hydraulic Cement Concrete.

G. ASTM D 610-08 Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces.

H. ASTM D714-02 (2009) Standard Test Method for Evaluating Degree of Blistering of Paints.

I. ASTM D1735-08 Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus.

J. ASTM E2074-00 Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

K. ASTM F1450-05 Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention Facilities.

L. ASTM F1577-05 Standard Test Methods for Detention Locks for Swinging Doors.

M. ASTM F1592-05 Standard Test Methods for Detention Hollow Metal Vision Systems

N. NAAMM Hollow Metal Manual, all sections.

O. NAAMM HMMA 850-00 Fire-Rated Hollow Metal Doors and Frames, Third Edition.

P. NFPA 80, 2010 edition, Fire Doors Other Opening Protectives

Q. NFPA 252. 2008 edition, Standard Methods of Fire Tests of Door Assemblies.

R. NFPA 257, 2007 edition, Standard on Fire Test for Window and Glass Block Assemblies.

S. UL-9, 8th edition, Standard for Safety for Fire Tests of Window Assemblies

T. UL-10B, 10th edition, Standard for Safety for Fire Tests of Door Assemblies.

U.

ANSI	American National Standards Institute, Inc. 25 W. 43rd Street New York, NY 10036
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428-2959
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Road Bldg. C, Suite 312 Glen Ellyn, IL 60137
NFPA	National Fire Protection Association 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269
UL	Underwriters Laboratories Inc. (UL) 333 Pfingsten Road Northbrook, IL 60062-2096

1.06 TESTING AND PERFORMANCE

A. Static Load Test:
   1. The test specimens shall be a 3’0” x 7’0” door with a 4” x 25” lite opening and hardware preparations, built in compliance with Paragraph 2.02.
   2. With the door supported at each end (no more than 4” from ends), with a centrally applied load of 14,000 lbs. at quarter points, the maximum mid-span deflection shall not exceed 0.58”. After release of load, deformation shall not exceed 0.10”.

B. Rack Test:
   1. The test specimens shall be a 3’0” x 7’0” door with a 4” x 25” lite opening and hardware preparations, built in compliance with Paragraph 2.02.
   2. With the door fixed at one end (no more than 6” from end) and a 6” square support under one corner of the unfixed end and a concentrated load of 7,500 lbs. on the unsupported corner of door, the maximum deflection shall not exceed 3.55“. The maximum acceptable deflection after release of load is 1.40".

C. Impact Load Test
   1. A standard 3’0” x 7’0” door with a 4” x 25” lite opening and hardware preparations, constructed in accordance with Paragraph 2.02, and with frame constructed in accordance with Paragraph 2.04 shall be mounted in the vertical position so that the door and locking hardware are operable. The door shall swing on 3 full mortised butt hinges and shall be locked using a door mounted, pocket type detention (e.g. Southern Steel 1080A) lock with bolt size not to exceed 2” high x 3/4” wide and latch throw not to exceed 7/8".
   2. A door ram pendulum system capable of delivering consistent impacts of up to 200 ft.-lbs. shall be constructed so that impacts may be delivered to any area of assembly.
   3. The ram pendulum system shall be positioned so that the door swings away from the ram. While hanging at rest, the ram shall be positioned so that the striking nose just touches the target area of

the door. The striking nose of the ram shall be made of C1010 or C1020 low carbon steel and the ram shall weigh 80 lbs. ± 1 lb. The striking surface area of the nose shall be 4.0 sq. in. ± 0.10 sq. in. at the start of the test.

4. With door closed and locked, and the above testing arrangement secured, the following series of impacts shall be delivered to the assembly. The ram shall be raised to a height so that when released it will strike the door with 200 ft.-lbs. of energy with each impact.
   a. 600 impacts on the door within 6" of the bolt.
   b. 200 impacts on the door within 6" of each hinge. Impacts to be performed in 8 cycles of 25 hits per hinge.
   c. 100 impacts on the door within 1 1/2" of the bottom and lock edge of the glazing opening.
5. The door shall remain closed and locked throughout the testing procedure, and the assembly shall not be damaged to the extent that forcible egress can be obtained. After testing is completed the door shall be capable of being unlocked, and operated to provide egress.

D. Edge Crush Test:
This test simulates a crushing attack on the edge of the door and also demonstrates the door's resistance to buckling across the surface.
1. The test specimen shall be a 3'0" x 7'0" door with a 4" x 25" lite opening and hardware preparations, built in compliance with Paragraph 2.02.
2. At the center of the edge of the door panel, apply load using a 1-1/2" diameter steel cylinder. Load shall be applied in the plane of the door, and the axis of the cylinder shall be perpendicular to the plane of the door. Ends of the test panel shall not be restrained. Test to then be repeated and recorded for the opposite edge.

Door gauge	12	14
Maximum Deformation at 8,000 lbs.	0.250"	0.250
Total Load Supported without Collapse	15,000 lbs.	10,000 lbs.

E. Vision System Impact Test:
1. The test specimens shall be representative of the application under investigation and shall include the mulilite (borrowed lite) and sidelite configurations. The test fixture for the vision system shall include a vertical masonry wall section constructed suitably to retain the samples throughout the testing procedure and shalll simulate the rigidity normally provided in a building by the ceiling, floor, and walls. The frame shall be constructed in accordance with Paragraph 2.04.
2. A steel plate of 3/8" minimum thickness shall be glazed in place using the specified glass stop. The removable glass stop shall be located on the opposite side of the 3/8" plate from the impact ram.
3. Using the door ram pendulum system specified in Paragraph 1.06.C2 deliver 600 impacts of up to 200 ft-lbs. each. Impacts shall be delivered in a cyclic sequence of 200 impacts at each location as identified for each assembly type below:
   Multilite Frame:
   a. On the frame joint between the vertical mullion and the sill or head
   b. On the frame joint between the horizontal mullion and the jamb (either side)
   c. On the frame joint where the vertical and horizontal mullions cross
   d. On the frame joint between the jamb and sill or head (either side)
   e. On the glazing/panel at the corner within 6" of the frame stop
   f. On the glazing/panel at the center
   Sidelite Frame:
   a. On the frame joint between the sidelite sill and strike mullion
   b. On the frame joint between the strike mullion and the header
   c. On the glazing/panel at the corner closest to the joint between the strike mullion and the header within 6" of the frame stop
   d. On the glazing/panel at the center
4. The glazing, panels, glazing stops, anchorage or frame that is damaged to the extent that forcible egress can be achieved constitutes failure.

F. Test Reports:

All test reports shall include details of test samples and details or photographs of the testing apparatus. The test samples shall be retained at the manufacturer's facilities for possible inspection.

G. Job Site Door Check:

At the owner's option, a door at the job site may be selected at random and sawed in half or otherwise taken apart as deemed necessary, for verification that construction is in accordance with test report details. If the door construction conforms to the test report details, the door will be replaced at no cost to the manufacturer. If the door construction does not conform to the details, all of the doors furnished shall be replaced at the manufacturer's expense with doors that meet specifications.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame assemblies of the type specified herein.
2. Manufacturer shall provide a list of representative detention security projects for which he has supplied detention security hollow metal products including dates of project completion.
3. Provide security hollow metal products and items from manufacturers who have not less than ten (10) years successful experience with and shall now be actively engaged in the design and manufacture of the security hollow metal doors and frame of the type required for this project. All security hollow metal doors and frames shall be produced by the same manufacturer.
4. Manufacturer requesting approval shall provide proof of financial responsibility such as a letter from a reputable bonding company stating that the supplier requesting approval can furnish a supply or performance bond for 100% of the contract.
5. Manufacturer shall submit to the Architect, ten (10) days prior to bid date, an independent testing laboratory report certifying that door and frame assemblies meet the performance requirements of Paragraph 1.06 and are constructed in accordance with Paragraphs 2.01 and 2.03 of these specifications.
6. Manufacturer shall submit to the Architect, ten (10) days prior to bid date, his qualifications as required by Paragraph 1.07.

B. Quality Criteria:

1. All door and frame assemblies shall meet the requirements of Paragraph 1.06 of these specifications.
2. Fire labeled doors and frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect. Such doors and frames shall be constructed as tested in accordance with ASTM E152 (UL-10B) and approved by Underwriters Laboratories or other recognized testing agencies having a factory inspection service.
3. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started. If for security reasons the design cannot be changed, the assembly will be built to UL equivalent construction but not labeled.
4. Fabrication methods and product quality shall meet standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Metal Manufacturers, NAAMM, as set forth in these specifications.

1.08 SUBMITTALS

A. Submittal Drawings:

1. Show door and frame elevations and sections.
2. Show listing of opening descriptions including locations, gauges, and anchorage.
3. Show location and details of all openings.

1.09 WARRANTY

All hollow metal work shall be warranted from defects in workmanship and quality for a period of one (1) year from shipment.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide security steel doors and frames, side lights and borrowed lights by a single firm specializing in production of this type of work. Provide units by one of the following:

1. Chief Industries, Inc., Grand Island, NE
2. Habersham, Inc., Cornelia, GA

2.02 HOLLOW METAL DOORS

A. Materials:

1. Doors shall be constructed of commercial quality, level, cold rolled steel conforming to ASTM A366 or hot rolled, pickled and oiled steel conforming to ASTM A569. The steel shall be free of scale, pitting, coil breaks or other surface blemishes. It shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
2. Interior doors: Face sheets shall be 14 gauge in thickness.
3. Exterior doors: Face sheets shall be 12 gauge in thickness and shall have a zinc coating applied by the hot-dip process conforming to ASTM A653/A653M (A60, G60/Z180 or ZF180 galvanized or galvaneal).

B. Construction:

1. All doors shall be of the types and sizes shown on the architectural/security drawings and approved submittal drawings and shall be constructed in accordance with the specifications and meet the performance requirements of Paragraph 1.06.A through 1.06.D, where applicable.
2. Door face sheets shall be joined at their vertical edges and to the vertical perimeter channels by a continuous weld extending the full height of the door.
3. Door thickness shall be 2” minimum to better accommodate detention hardware. Doors shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight and of minimum radius for the gauge of metal used.
4. The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 16 gauge minimum thickness, spaced so that the vertical interior webs shall be no more than 4” apart horizontally and securely fastened to both face sheets by spot welds spaced a maximum of 3” o. c. vertically. Spaces between stiffeners shall be filled with mineral rock wool batt-type material.
5. The vertical edges shall be reinforced by a continuous steel channel, not less than 10 gauge thickness extending the full length of the door. The top and bottom edges shall be closed with a continuous channel, also not less than 10 gauge thickness, spot or plug welded to both face sheets a maximum of 3” o. c. The 10 gauge closing end channel shall be welded to the vertical reinforcing channel at all four corners producing a fully welded perimeter reinforcing channel.
6. The top end channel shall be fitted with an additional flush closing channel of not less than 16 gauge thickness. The flush closing channel shall be welded in place at the corners and at the center. Installation of closer channel, using screws, security or otherwise, shall be deemed unacceptable. The end channel and flush closer channel shall be installed so that they are permanent and non-removable.
7. Edge profiles shall be provided on both vertical edges of doors as follows:
    * Single acting doors-beveled 1/8” in 2” profile.
    * Sliding doors or equivalent-square profile.
8. Hardware Reinforcements:
    a. Doors shall be mortised, reinforced, drilled and tapped at the factory for completely templated mortised hardware only, in accordance with the final approved hardware schedule and

templates provided by the hardware supplier. Where surface mounted hardware is to be applied, doors shall be reinforced, and all drilling and tapping shall be done at the factory.

b. Minimum gauges for hardware reinforcements shall be as follows:
   * Full mortise hinges and pivots 3/16”
   * Surface applied maximum security hinges 1/4” plate
   * Reinforcements for hanger attachment per device mfr. recommendations
   * Reinforcements for lock fronts, concealed holders, or surface mounted closers 12 gauge
   * Internal reinforcements for all other surface applied hardware 12 gauge
   * Pull reinforcements 3/16”

c. In cases where electrically operated hardware is required, and where shown on architectural/security drawings and approved submittal drawings, hardware enclosures and junction boxes shall be provided, and shall be interconnected using U.L. approved type 3/4” minimum conduit and connectors.

9. Glass moldings and stops:
   a. Where specified, doors shall be provided with steel moldings to secure glazing by others in accordance with glass sizes and thicknesses shown on approved submittal drawings.
   b. Fixed glass molding shall be not less than 10 gauge, and shall be spot welded to both face sheets 3” o. c. maximum.
   c. In openings where security glass is specified and where shown on the architectural/security drawings and approved submittal drawings, pressed steel angle glazing stops, not less than 10 gauge thickness, shall be provided. Angle stops shall be mitered and tight fitting at the corner joints, and secured in place using 1/4 - 28 button head tamper resistant machine screws with spacing necessary to satisfy the performance criteria outlined in Paragraph 1.06.E, 8” o. c. maximum.
   d. The metal surfaces to which glazing stops are secured and the inside of the glazing stops shall be chemically treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door.
10. Louvers shall be of welded inverted vee or y type construction providing free air delivery as shown on the architectural/security/mechanical drawings and approved submittal drawings. A rectangular louver shall not exceed 18” in width without being reinforced at its midpoint by a vertical rectangular steel bar at least 1/4” x 1 1/2”. The inverted vee type vanes shall be no less than 12 gauge and shall be spaced so that no rigid flat instrument can be passed through them. Insert screens and/or flattened expanded metal not less than 12 gauge shall be provided on louvered doors in exterior locations where shown on architectural/security/mechanical drawings and approved submittal drawings. Louvers of other designs which meet the security requirements may be qualified for this application.
11. Speaking devices shall consist of a rectangular pattern of round holes, no more than 1/4” dia., in both face sheets directly across from each other. The minimum size of the rectangular hole pattern shall be 1” high x 4” wide with a minimum of two rows of holes spaced no more than 1” o. c. The interior of the door between the rectangular hole patterns shall be baffled using pressed steel section, not less than 14 gauge, so that no objects can be passed through.
12. Food pass openings:
    a. The food pass opening shall be a flush opening fabricated using interior channels 10 gauge minimum thickness, securely welded to the inside of both face sheets. The four corner seams shall be continuously arc welded and dressed smooth. The finishing opening shall be of such construction that it cannot be dismantled or otherwise affected by tampering or scraping.
    b. The food pass shutter shall be constructed from two 3/16” steel plates plug welded together to produce an inset fit that, when closed, will prevent tampering with the lock and hinges.
    c. The shutters shall be treated for maximum paint adhesion and given a shop coat of rust inhibitive primer. They shall be shipped loose for installation in the field by others.

2.03 HOLLOW METAL PANELS

A. Hollow metal panels shall be of the same materials, construction, and finish as specified in sections 2.01 and 2.06 of this section.

2.04 HOLLOW METAL FRAMES

A. Materials:
1. Frames shall be constructed of commercial quality, cold rolled steel conforming to ASTM A366 or hot rolled, pickled and oiled steel conforming to ASTM A-569. The steel shall be free of scale, pitting, coil breaks or other surface defects.
2. Interior openings: Steel shall be 12 gauge minimum thickness.
3. Exterior openings: Steel shall be 12 gauge minimum thickness and shall have a zinc coating applied by the hot-dip process conforming to ASTM A653/A653M (A60, G60/Z180 or ZF180 galvanized or galvaneal).

B. Construction:
1. All frames shall have integral stops and be welded units of the sizes and types shown on approved submittal drawings. Frames shall be constructed in accordance with these specifications and meet performance criteria specified in Paragraph 1.06.C and 1.06.E where applicable.
2. All finished work shall be neat in appearance, square, and free of defects, warps and buckles. Pressed steel members shall be straight and of uniform profile throughout their lengths.
3. Jamb, header and sill profiles shall be in accordance with frame schedule and as shown on the approved submittal drawings.
4. Corner joints shall have all contact edges closed tight with faces mitered and stops butted. Corner joints shall be continuously welded and the use of gussets or splice plates shall be unacceptable.
5. Minimum depth of stops in door openings shall be 5/8". Stops on glass or panel openings shall be as shown on architectural/security drawings and approved submittal drawings. Cutoff stops, where shown, shall be capped at 45 or 90 degrees at heights as shown on approved submittal drawings, and jamb joints below cut-off stops shall be welded, filled and ground smooth so that there are no visible seams.
6. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for splicing in the field by others. Where splicing is necessary, angle splices shall be installed at the corners of the profile, and shall extend at least 4" on either side of the joint. Splicing angles shall be the same minimum gauge thickness as frame. Field splices shall be made in accordance with approved submittal drawings.
7. Frames for multiple openings shall have mullion members which, after fabrication, are closed tubular shapes conforming to profiles shown on approved submittal drawings, and having no visible seams or joints. All joints between faces of abutted members shall be continuously welded and finished smooth. All joints between abutted members shall be welded along the height of the stop and shall be left neat and uniform in appearance. The contractor responsible for installation shall provide for welding and finishing of all field joints between faces of abutted members.
8. Hardware Reinforcements and Preparation:
   a. Frames shall be mortised, reinforced, drilled and tapped for all templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware is to be applied, frames shall be reinforced, and all drilling and tapping shall be done at the factory.
   b. Minimum thicknesses of hardware reinforcing plates shall be as follows:
      * Hinge and pivot reinforcements 3/16" x 1 1/2" x 10" length
      * Strike reinforcements 3/16"
      * Closer reinforcements 3/16"
      * Flush bolt reinforcements 3/16"
      * Reinforcements for surface applied hardware 12 gauge
   c. In cases where electrically operated hardware is required, and where shown on approved submittal drawings, hardware enclosures and junction boxes shall be interconnected using only UL approved type 3/4" minimum conduit and connectors. Also, where shown on architectural/security drawings and submittal drawings, junction boxes with access plates shall be provided to facilitate the proper installation of wiring. Access plates shall be the same gauge as the frame and fastened with a minimum of four (4) 1/4-28 tamper resistant machine screws, not to exceed 6" o. c.

9. Loose glazing stops:
    a. In openings where security glass is specified and where shown on the architectural/security and approved submittal drawings, pressed steel angle glazing stops, not less than 10 gauge, shall be provided. Angle stops shall be mitered and tight fitting at the corner joints, and secured in place using machine screws of the size and spacing necessary to satisfy the performance criteria outlined in Paragraph 1.06.E, spaced 8" o. c. maximum.
    b. The frame underneath the glazing stops and the inside of the glazing stop shall be treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the frame.
10. Floor Anchors:
    a. Floor anchors with two holes for fasteners shall be fastened inside jambs with at least four (4) spot welds per anchor.
    b. Where so scheduled, adjustable floor anchors, providing no less than 2" height adjustment, shall be fastened in place with at least four (4) spot welds per anchor.
    c. Minimum gauge thickness of floor anchors shall be the same as frame.
11. Jamb Anchors:
    a. Masonry Type:
    Frames for installation in masonry walls shall be provided with loose "T" anchors made from minimum of 16 gauge or adjustable jamb anchors of the strap and stirrup type made from the same gauge steel as frame. Straps shall be no less than 2" x 10" in size, corrugated and/or perforated. The number of anchors provided on each jamb shall be as follows:
        * Borrowed lite frames: 2 anchors plus 1 for each 18" or fraction thereof over 3'0" spaced at 18" maximum between anchors.
        * Door Frames: 2 anchors plus 1 each 18" or fraction thereof over 4'6", spaced at 18" maximum between anchors (U.L. fire ratings may require additional anchors).
    b. Embedment Masonry Type
        1. Masonry type frames for installation in prefinished masonry or concrete openings shall be provided with removable faces at the jambs, and 3/16" x 2" x 2" angle anchors 4" long spaced as described in Paragraph 2.03B.10.a. The frame anchors shall be located to coincide with the matching embedded anchors to be provided for installation in the wall.
        2. Embedded wall anchors shall consist of a 3/16" x 4" wide x 6" plate with 3/16" x 2" x 2" anchors 4" long welded in place at locations to match angle anchors in frames. The embedded plate shall be provided with two (2) #4 re-bar wall anchors 10" long minimum, with 2" x 90 degree turn down on ends continuously welded in place, and spaced as described in Paragraph 2.03.B.10.a Embedments shall be prime painted in accordance with Paragraph 2.06. Angle anchors shall each be fastened to jamb and to embedded plate with two (2) 1" long field arc welds at each end of the anchor. Anchors shall be shipped loose.
        3. The complete anchorage system shall provide that the jamb faces be removed from the frames in the field by the contractor responsible for installation, and the frames be moved into the opening until the anchors contact and match the embedded anchors. The contractor responsible for installation shall field weld all anchors and install the jamb faces in place. Embedment anchoring details shall be provided on approved submittal drawings.
    c. Expansion Bolt Type
        1. Frames for installation in existing masonry or concrete walls shall be prepared for expansion bolt type anchors. The preparation shall consist of a countersunk hole for a 1/2" diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and the preparation spaced as described in Paragraph 2.03.B.10.a
        2. After sufficient tightening of the bolt, the bolt head shall be welded so as to provide a non-removable condition. The welded bolt head shall be ground, dressed and finished smooth.

3. Frames to be installed in prefinished concrete, masonry or steel openings, shall be constructed and provided with anchoring systems of suitable design as shown on the approved submittal drawings.

12. Plaster guards made from not less than 26 gauge thick steel shall be welded in place at all hardware mortises on frames to be set in masonry or concrete openings.
13. All frames shall be provided with two (2) temporary steel spreaders welded to the feet of the jambs to serve as bracing during shipping and handling.

2.05 CLEARANCES AND TOLERANCES

A. Edge clearances for swinging doors shall not exceed the following:
1. Between doors and frames at head and jambs: 1/8”
2. Between edges of pairs of doors: 1/8”
3. At door sills where a threshold is used: 1/8” over threshold.
4. At door sills where no threshold is used: 3/4”

B. Manufacturing tolerance shall be maintained within the following limits:
1. Frames for single door or pair of doors:
Width, measured between rabbets at the head:
Nominal opening width + 1/16”, - 1/32”.
Height (total length of jamb rabbet): Nominal opening height ± 3/64”.
Cross sectional profile dimensions:
* Face ± 1/32”
* Stop ± 1/32”
* Rabbet ± 1/64”
* Depth ± 1/32”
* Throat ±1/16” Frames overlapping walls to have throat dimension 1/8” greater than dimensioned wall thickness to accommodate irregularities in wall construction.

2. Swinging and sliding doors:
* Width ± 3/64”
* Height ± 3/64”
* Thickness ± 1/16”
* Hardware cutout dimensions
Template dimensions + 0.015” - 0”.
* Hardware location ± 1/32”
* Bow/Flatness ± 1/8”

2.06 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as shown on the architectural/security drawings or as listed below.

B. Hinges:

Top	5” from frame head to top of hinge
Bottom	10” from finished floor to bottom of hinge
Intermediate	centered between top and bottom hinges

C. Unit and integral type:

Detention locks	40” to centerline of lock bolt
Non Security locks and latches	38” to centerline of knob
Deadlock	46” to centerline of strike
Panic hardware	38” to centerline of cross bar
Door Pulls	42” to centerline of grip
Push/Pull bars	42” to centerline of bar

Push plates	48” to centerline of plate

2.07 FINISH

A. After fabrication, all tool marks and surface blemishes shall be filled and sanded as required to make both faces, vertical edges and weld joints free from irregularities. After appropriate preparation, all exposed surfaces shall receive a rust inhibitive primer which meets or exceeds ASTM D1735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.

PART 3 – EXECUTION

3.01 SITE STORAGE AND PROTECTION OF MATERIALS

A. The contractor responsible for installation shall remove wraps or covers from doors and frames. The contractor responsible for installation shall see that any scratches or disfigurement caused in shipping or handling are promptly cleaned and touched up with a rust inhibitive primer.
B. The contractor responsible for installation shall see that materials are properly stored on planks or dunnage in a dry location. Doors shall be stored in a vertical position and spaced by blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

3.02 INSTALLATION

The contractor responsible for installation shall perform the following:

A. Prior to installation, all frames must be checked and corrected for size, swing, squareness, alignment, twist and plumpness. Permissible installation tolerances shall not exceed the following:
   * Squareness ± 1/16”: Measured on a line, 90 degrees from one jamb, to the upper corner of the frame at the other jamb.
   * Alignment ± 1/16”: Measured on jambs on a horizontal line parallel to the plane of the wall.
   * Twist ± 1/16”: Measured at face corners of jambs on parallel lines perpendicular to the plane of the wall.
   * Plumbness ± 1/16”: Measured on the jamb at the floor.

B. Frame jambs shall be fully grouted (reference HMMA-820 TN01-03 “Grouting Hollow Metal Frames” - plaster grout should be avoided) to provide added security protection against battering, wedging, spreading and other means of forcing open the door. Jamb mounted lock preparations, grout guards and junction boxes are intended to protect hardware mortises and tapped mounting holes from masonry grout of 4” maximum slump consistency which is hand trowelled in place. If a light consistency grout (greater than 5” slump) is to be used, special precautions must be taken in the field by the installation contractor to protect tapped holes, electrical knockouts, lock pockets, grout guards, junction boxes, etc., in the frames.

C. Any grout or other bonding material shall be cleaned off of frames or doors immediately following installation. Exposed hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.

D. Proper door clearances must be maintained in accordance with 2.04 of these specifications, except for special conditions otherwise noted. Where necessary, metal hinge shims, furnished by the Contractor responsible for installation, are acceptable to maintain clearances.

E. Hardware to be applied in accordance with hardware manufacturer’s templates and instructions.

F. Exposed field welds shall be finished smooth and touched up with a rust inhibitive primer.

G. Primed or painted surfaces which have been scratched or otherwise marred during shipping or installation shall be touched up with a rust inhibitive primer.

END OF SECTION

SECTION 12492 - HORIZONTAL LOUVER BLINDS

PART 1 – GENERAL

1.00 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.01 DESCRIPTION

A. Material and installation of 2" Horizontal Louver Blinds With Aluminum Slats at each window location.

1.02 SUBMITTALS

A. Manufacturer’s complete CSI 3- part specification sheet.
B. Submit working hand sample or mock up blind as required.
C. Submit two 6" samples of aluminum slat indicating color and dimensions.
D. Approval of submittals by Architect shall not relieve contractor from installing blinds with adequate clearance to permit smooth operation of the blinds and demonstrating blinds to be in smooth, uniform working order. Contractor must field verify all dimensions.

1.03 DELIVERY, STORAGE AND HANDLING

A. Product to be delivered in manufacturer’s original packaging.
B. Products to be handled and stored to prevent damage to materials, finishes and operating mechanisms. Store in a clean, dry area, laid flat to prevent sagging and twisting of packaging.

1.04 EXTRA STOCK

A. Describe extra attic stock as required: One (1) additional horizontal louver blind.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Springs Window Fashions LLC or approved architect equivalent.
B. Substitutions Request: Submit for approval under provisions of section 01600.

2.02 HORIZONTAL BLINDS

A. Product: Bali® 2” Aluminum School Blinds

B. Color Name: As Selected by Architect; Color Number: As Selected by Architect.

C. SureClose® Headrail shall be 1 5/8" high x 2 1/4" wide x .022” thick U-shaped steel with 1/8” light blocking lip on the bottom centerline. The steel finishing process includes phosphate treatment for corrosion resistance, a chrome-free sealer, a low HAP urethane primer and a topcoat with low HAP polyester baked enamel.

D. Cord tilter shall be a snap-in component incorporating a worm and pulley of low-friction thermoplastic and a nylon gear. Standard tilt cords shall measure 2.2 mm in diameter.
Select One:
- ☐ Cord tilter (standard)
- ☒ Wand tilter
- ☐ Ring tilter

E. Cord lock shall be metal of a snap-in design incorporating a floating, shaft-type locking pin and shall incorporate a crash proof safety feature that will lock blind automatically upon release of cord
Options:
- ☐ Ring pull provides a single plated steel ring in lieu of tassels with a nominal 4" cord length.

F. Lift cord shall be made of braided polyester measuring 2.2mm in diameter.

G. Vinyl ladder tape shall be 1 1/2” wide reinforced vinyl. Standard ladder spacing shall be 42mm.
Select One Vinyl Tape Color:
- ☒ 005 White
- ☐ 670 Creamy Beige
- ☐ 904 Lamplight
- ☐ 983 Gray Haze
- ☐ 062 Char Brown

H. Slats shall be 5000 series cold-rolled aluminum containing the maximum allowable recycled content to produce a high strength and corrosion resistant flexible product. Slats shall be nominally 2” wide x .008" thick and treated with Advanced Finishing Technology (AFT), providing a smooth, hard, less porous surface. AFT delivers anti-static performance to repel dust and anti-microbial qualities to resist fungal and bacterial growth. Slats shall be treated with a chrome-free sealer and a topcoat of low HAP polyester baked enamel.

I. Bottomrail shall be “C” shaped 9/16” high x 2” wide x .040 thick anodized aluminum. It is fully enclosed with a dust cover slat and finished with a polyester baked enamel to match headrail.

2.03 FABRICATION

A. Blinds shall be fabricated according to specifications and accurate to tolerance established by SWF engineering standards

PART 3 – EXECUTION

3.01 INSPECTION

A. Installer shall be responsible for inspection of jobsite, approval of mounting surfaces, verification of field measurements and installation conditions. Installation shall commence when satisfactory conditions are met.

B. Do not dimension the drawings. Any questions concerning dimensions should be directed to the Architect for clarification.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions including recommended support brackets and fasteners.

B. Install blinds with adequate clearance to permit smooth operation of the blinds. Demonstrate blinds to be in smooth, uniform working order.

3.03 MAINTENANCE AND CLEANING

A. Maintain and clean blinds in accordance with manufacturer's instructions.

END OF SECTION

SECTION 13065 - BULLET RESISTANT POLYCARBONATE SECURITY GLASS

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contractor for Construction and the Supplementary Conditions to the General Conditions of the Contract for the Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addendum issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the stringent requirements and the greater quantity shall apply.

1.1 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment, ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass, NIJ Standard 0108.01 - (National Institute of Justice) Standard for Ballistic Resistant Protective Materials (September, 1985).

1.2 SUBMITTALS

B. The following shall be submitted by the manufacturer in accordance with Sections 13070 and any Special Contract Requirements: Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location , product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

C. Provide manufacturer’s instructions for installation and cleaning of TSS Bullet Resistant Polycarbonate. All required submittals shall be approved prior to installation.

1.3 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Bullet Resistant Polycarbonate Security Glass shall be constructed of Laminated Acrylic/Polycarbonate sheets. With a UL Standard 752 Level 1, 2, or 3 rating.

B. Light Transmission in excess of 87%.

1.4 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years experience. Installer shall be a Company that specializes in product type specified. Manufacturer shall provide a sample with color/finish to the Architect for approval prior to start of work.

1.5 DELIVERY, STORAGE & HANDLING

A. Delivery the materials to the project with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.6 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year from the date of Substantial Completion. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall be manufactured by: Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 866-930-7807. Jim Richards, info@demandtss.com . Web: www.tssbulletproof.com .

B. Substitutions will be in accordance with Section 01600.

2.2 PRODUCT: BULLET RESISTANT POLYCARBONATE SECURITY GLAZING.

A. Product to be TSS POLYCARBONATE : Level 2 LP1000 - 1.00"

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.3 POST APPLICATION

A. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

B. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION

SECTION 13070 - BULLET RESISTANT HOLE AND BACKER WINDOW ASSEMBLY

PART 1 GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment & ASTM E119-98-Standard Test Methods for Fire Tests of Building Construction and Materials, NIJ Standard 0108.01-(National Institute of Justice) Standard for Ballistic Resistant Protective Materials, ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate, ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

1.2 SUBMITTALS

A. The following shall be submitted by the manufacturer in accordance with Sections 13070 and any Special Contract Requirements and coordinate with Sections 01340: Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location , product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

B. Manufacturer’s Instructions for installation and cleaning of TSS Bullet Transaction Window Assemblies. All required submittals shall be approved prior to installation.

1.3 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Bullet Hole and Backer Design Transaction Window shall be of the “non-ricochet” type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration. This assembly shall provide single transaction positions utilizing the “Acrylic” backer configuration. This design shall employ an acrylic voice ports in transaction glazing to complete the “Hole and Backer” design. Each transaction position shall have a stainless steel dip tray as shown on the drawings. Components must be manufactured in strict accordance with the specifications, design and details. All vision panels shall be cut to size with all exposed edges polished. Necessary holes shall be pre drilled and tapped where required. Stainless Steel assembly screws and acrylic spacers shall be provided. Clear anodized angles and channels shall be provided. Anchor screws shall be provided by the installer.

B. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect. Standard manufacturing tolerances shall be +/- 1/16".

C. Materials shall meet or exceed UL 752 requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years experience. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer. Manufacturer shall provide a Mock-up, if required, for evaluation of surface preparation and application workmanship and color/finish to the Architect for approval prior to start of work.

1.5 DELIVERY, STORAGE & HANDLING

A. Delivery the materials to the project with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.6 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year after Substantial Completion Date. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall be manufactured by: Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 866-930-7807. Jim Richards, info@demandtss.com . Web: www.tssbulletproof.com .

B. Substitutions shall be in accordance with Section 01600 Substitution Procedures.

2.2 BULLET RESISTANT ARCH TRANSACTION WINDOW

A. Product shall be: TSS HB Transaction Window: The Hole and Backer System consists of custom prefabricated bullet resistant panels with secure air passage as required for voice transmission. Aluminum frame, with a stainless steel base and counter mounted cash tray. All accessories for installation are included.

B. Glazing Panels shall be:

Bullet Resistant Level 2
1" LP 1000 Laminated

C. Cash tray: Counter mounted, Stainless Steel.

D. Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place.

Angles and stops are only acceptable for top attachment.

1) Frame to be 18 ga. stainless steel. The bottom of the glazing to be capped with corresponding material on the frame (ie: stainless steel on stainless steel). Provide a shelf 2" thick with a recessed deal tray. The shelf to be full width of window, 12" deep, centered under the glazing and covered with a stainless steel 18 ga. #4 finish.

2). Deal tray to be 18 ga. stainless steel, # 4 finish 16" x 10" from the outside edge of flanges with a clear opening .

E. Product size shall be: As noted on drawings.

PART 3 EXECUTION

3.1 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.2 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb. All products shall be installed per installation instructions provided by the manufacturer, if warranty is to be issued.

B. HB Transaction Window: shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure (anchors by others).

3.3 POST APPLICATION

A. HB Transaction Window: shall be installed in accordance with manufacturer's printed recommendations, including adhering to anchoring and finishing details.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION

SECTION 13471 – UL 752 LEVEL 2 BULLET-RESISTANT FIBERGLASS PANELS

PART 1 – GENERAL

1.0 COORDINATION

A. The General Conditions of the Contract for Construction and the Supplementary Conditions to the General Conditions of the Contract for Construction shall be considered as part of this section of the specifications.

B. Each Bidder shall be responsible for determining during the bidding period the extent that any addenda issued during the bidding period may affect this section of the specifications.

C. Reference Instructions to Bidders for requirements regarding substitutions of materials and products.

D. Where conflicts occur between the drawings and specifications, between different drawings, between different portions of this section of the specifications, or between different sections of the specifications, the more stringent requirements and the greater quantity shall apply.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.2 REFERENCES

A. Underwriters Laboratories:
   1. UL 752 Specifications and Ammunition, 11th Edition, Standard for Bullet Resisting Equipment published September 9, 2005, revised December 21, 2006, Level 2

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 13471 and the SPECIAL CONTRACT REQUIREMENTS (Submit for approval prior to fabrication samples, brochures, specifications):

A. UL LISTING Verification and UL752 Current Test Results as provided by Underwriters Laboratories.
B. Printed data in sufficient detail to indicate compliance with the contract documents.
C. ASTM E119-98 One-Hour Fire Rating of Building Construction and Materials.
D. Manufacturer's Instructions for installation of Bullet Resistant Fiberglass Panels.

1.4 DESIGN

A. Through the design, manufacturing technique and material application the Bullet Resistant Fiberglass shall be of the "non-ricochet type." This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Deliver the materials to the project with the manufacturer's UL LISTED Labels intact and legible.
B. Handle the material with care to prevent damage. Store the materials inside under cover, stack flat and off the floor.

1.6 WARRANTY

A. All materials and workmanship shall be warranted against defects for a period of ten (10) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers:
   1. Waco Composites, Ltd., Waco, TX 76710, fax: 254-752-3634, 254-752-3622
      email: sales@armorcore.com

B. Substitutions: Permitted in accordance with Section 01600 Substitution Procedures.

2.2 PERFORMANCE CRITERIA

A. Bullet Resistant Fiberglass Panels shall be “non ricochet type” to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.
B. Panel Rating: UL752 Level 2.
C. Bullet resistance of joints: equal to that of the panel.

2.3 MATERIALS

A. Panels fabricated of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets.
B. Thickness: 5/16” nominal thickness
C. Nominal Weight: 3.6 lbs. per sq. ft.
D. Panel Sizes: 4’ x 8’
E. Panels manufactured in the United States of America with raw materials sourced from the U.S.A. for quality assurance purposes and to comply with any applicable “Buy American” provisions.

2.4 SECURITY LEVEL

A. The Bullet Resistant Fiberglass will be rated and tested for UL752 Level 2.

PART 3 - EXECUTION

3.1 SUPPORTING MEMBERS

A. Prior to installing the bullet resistive material the contractor shall verify that all supports have been installed as required by the contract documents and the architectural drawings.

3.2 JOINTS

A. All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4-inches (2” on each panel or a 2” minimum overlap).

3.3 APPLICATION

A. Armor shall be installed in accordance with the manufacturer’s printed recommendations. Armor panels shall be adhered using an industrial adhesive, mastic, screws or bolts. Method of application shall maintain the bullet resistive rating at junctures with the concrete floor slab, the concrete roof slab, the bullet resistive door frames, the bullet resistive window frames, and all required penetrations.

END OF SECTION

SECTION 15010 - SUMMARY OF MECHANICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. Mechanical Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC
3533 Moreland Dr. Ste. A
Weslaco, Texas 78596
Phone Number: (956) 973-0500
Contact Person: Leonardo Munoz, P.E.

C. General Scope of Work:

1. Install AC equipment and ductwork as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect power to unit.

2. HVAC: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:

- Chilled Water Central Station Units
- Exhaust fans
- Sheet metal, Ductwork
- Diffusers and Grilles
- Duct accessories, including grilles, and louvers
- HVAC Controls
- Air Test and Balance

1.3 CONTINGENCY

1. Refer to architectural specifications for Mechanical Contingencies.

1.4 COORDINATION

A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, even in areas where only mechanical work is to take place.
B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.
C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.

D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

E. Fully coordinate with electrical contractor for providing power to mechanical equipment.

F. Mechanical Contractor is responsible for all control wiring including thermostat(s). This includes all conduit, wire, and accessories both low voltage and source voltage for the controls' system. Mechanical Contractor will provide all the necessary actuators, relays, software, hardware, and all necessary accessories required for a fully functional controls' system.

1.5 UTILITIES

1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

1. To extradite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire mechanical or plumbing in a bound enclosure. This will eliminate delays in the submittal process.

END OF SECTION

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Nonshrink grout for equipment installations.
9. Field-fabricated metal and wood equipment supports.
10. Installation requirements common to equipment specification sections.
11. Cutting and patching.
12. Touchup painting and finishing.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

B. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
3. Sizes and location of required concrete pads and bases.
4. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
5. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes, ductwork, equipment, and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.8 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments, and complete punch list items before final acceptance by the Owner.

C. The date of acceptance by the Engineer, for beneficial use by the Owner, shall be the beginning date of the warranty period.

1.9 SPACE AND EQUIPMENT ARRANGEMENT

A. The size of each item of mechanical equipment shown on the Drawings is based on the dimensions of a particular manufacturer as indicated. While other manufacturers may be acceptable, it shall be the responsibility of the Contractor to determine whether or not the equipment he proposes to furnish will fit into the space. Shop drawings shall be prepared when required by the engineer to indicate a suitable arrangement.

B. Install equipment in a manner to permit access to all surfaces. Install valves, motors, drives, lubricating devices, filters, and other accessory items in a position to allow removal for service without requiring the disassembly of another part.

C. Provide access panels acceptable to the Engineer for equipment that is concealed above ceiling space.

D. Large equipment assemblies or components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is completed.

Provisions shall be implemented by the Contractor to insure that the equipment will not be damaged in any way during the associated construction procedures.

1.10 START-UP OF EQUIPMENT AND SYSTEMS

A. Whenever the manufacturer of a particular item of equipment or a particular system makes available a start-up service after completion of the installation, such manufacturer's start-up service (rendered by the manufacturer or his authorized representative) shall be provided.

B. Witnessing and explanations of start-up services shall be included as part of the "Instruction of Owner's Personnel" as specified below.

1.11 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers or technicians acceptable to the Engineer to instruct representatives of the Owner in complete and detailed operation and maintenance of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include piping diagrams, valve identification charts, control and interlocking wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.

D. Provide the Owner with three (3) complete sets of all maintenance manuals, pamphlets, brochures or instructions. This material shall be catalogued, indexed and bound into books.

1.12 ACCEPTABLE MANUFACTURERS

A. Provide equipment and materials from listed manufacturers listed within this specification. Deviations from this specification will not be acceptable. When one manufacturer is listed, alternate materials and equipment may be provided "equal to" the listed. When more than one manufacturer is listed, equipment and material must be provided by one of the listed manufacturers.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS

A. Each item of equipment furnished under this Division of the Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of

equipment are required, these shall be the products of a single manufacturer; however, the component parts of the equipment need not be the products of one manufacturer.

B. Materials and equipment shall be of the base quality normally used in good commercial practice, and shall be the products of reputable domestic manufacturers unless otherwise specified. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

2.2 QUALITY AND CLASSIFICATION OF MATERIALS

A. Materials and equipment shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials or equipment identical with those damaged.

B. Wherever a UL standard has been established for a particular type of material or equipment, each such material or equipment provided on this project shall meet the requirements of the UL standard in every way and shall be UL listed and labeled.

2.3 LOCAL PARTS AND SERVICE

A. Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. “Local” shall be defined, for this purpose, as “within 50 miles of the project site.”

2.4 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials used for insulation, acoustical linings, adhesives, jackets and coatings, and combinations of these materials, shall each have a flame spread rating of 25 or less, and a smoke developed rating of 50 or less, as determined by an independent testing laboratory in accordance with NFPA-255.

2.5 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

    a. Watts Industries, Inc.; Water Products Div.
    b. Zurn Industries, Inc.; Wilkins Div.

2. Mechanical Sleeve Seals:

    a. Calpico, Inc.
    b. Metraflex Co.
    c. Thunderline/Link-Seal.

2.6 PIPE AND PIPE FITTINGS

A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.7 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
2. PVC to ABS Piping Transition: ASTM D 3138.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.8 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.10 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: One piece, with set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Cast-Iron Floor Plate: One-piece casting.

2.11 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
   b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 for materials.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe or pipe insulation and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. PVC Nonpressure Piping: ASTM D 2855.
    c. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

W. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT AND MATERIAL INSTALLATION - COMMON REQUIREMENTS

A. Install equipment and material to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment and ductwork giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 PAINTING AND FINISHING

A. Refer to Division 9 for paint materials, surface preparation, and application of paint.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement or as specified in Division 3.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.7 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION

SECTION 15060 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

B. Related Sections include the following:

1. Division 5 Sections for materials for attaching hangers and supports to building structure.
2. Division 13 Sections on fire-suppression piping for fire-suppression pipe hangers.
3. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for vibration isolation and seismic restraint devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.

1. 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 hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers:

a. Globe Pipe Hanger Products, Inc.
b. Grinnell Corp.
c. Michigan Hanger Co., Inc.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
3. Extension Hinged Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. C-Clamps (MSS Type 23): For structural shapes.
5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
7. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching tobottom of steel I-beams for heavy loads, with link extensions.
8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

I. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.9.

2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION

SECTION 15070 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe, and equipment hangers, supports and associated anchors.

B. Sleeves and seals.

C. Flashing and sealing equipment and pipe stacks.

1.02 RELATED WORK

A. Section 15240 - Vibration Isolation.

B. Section 15260 - Piping Insulation.

C. Section 15280 - Equipment Insulation.

D. Section 15330 – Wet Pipe Fire Protection Sprinkler System.

E. Section 15410 - Plumbing Piping and Valves.

F. Section 15510 - Hydronic Piping.

G. Section 15530 – Refrigerant Piping

1.03 REFERENCES

A. ANSI/ASME B31.1 - Power Piping.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems.

C. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

1.04 QUALITY ASSURANCE

A. Supports for Sprinkler Piping: In conformance with NFPA 13.

B. Supports for Standpipes: In conformance with NFPA 14.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division One.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches Carbon steel, adjustable, clevis.

C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and over: adjustable steel yoke and cast iron roll.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Roof Pipe Supports and Hangers: Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.

For pipes 2-1/2" and smaller – Type PP10 with roller
For pipes 3" through 8" – Type PS
For multiple pipes – Type PSE - Custom

K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut "Cush-A-Clamp" or equal. Hangers: Plastic coated; Unistrut or equal.

L. For installation of protective shields refer to specification section 15140-3.03.

M. Shields for Vertical Copper Pipe Risers: Sheet lead.

N. Pipe Rough-In Supports in Walls/Chases: Provide preformed plastic pipe supports, Sioux Chief "Pipe Titan", Holdrite or equal.

2.02 HANGER RODS

A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.03 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING

A. Metal Flashing: 20 gage galvanized steel.

B. Lead Flashing: 4 lb. /sq. ft. sheet lead for waterproofing; 1 lb. /sq. ft. sheet lead for soundproofing.

C. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

D. Coordinate with roofing contractor/architect for type of flashing on metal roofs.

2.05 EQUIPMENT CURBS

A. Fabricate curbs of hot dipped galvanized steel.
1. Provide with hurricane clip to anchor RTU to roof curb.

B. For metal roof construction, roof curbs shall be made of aluminum or stainless steel. Coordinate with architectural drawings and details.

2.06 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded to form a uniform sleeve.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, schedule 40.

C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated steel sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

F. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.

G. Caulk: Paintable 25-year acrylic sealant.

H. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

2.07 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

2.08 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

PART 3 - EXECUTION

3.01 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with structural engineer for placement of inserts.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4

inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with structural engineer prior to start of work.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
(Steel Pipe)		
1/2 to 1-1/4 inch	7'-0"	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"
3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.

J. Portable pipe hanger systems shall be installed per manufacturers' instructions.

K. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.03 Insulated Piping: Comply with the following installation requirements.

A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

C. Shields: Install protective shields MSS Type 40 on cold and chilled water piping that has vapor barrier. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

NPS	LENGTH	THICKNESS
1/4 THROUGH 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 THROUGH 14	24	0.075
16 THROUGH 24	24	0.105

D. Piping 2" and larger provide galvanized sheet metal shields with calcium silicate at hangers/supports.

E. Insert material shall be at least as long as the protective shield.

F. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.05 FLASHING

A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor shower mop sink and all other drains watertight to adjacent materials.

E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact architect for all flashing details and roof construction. Seal penetrations watertight.

3.06 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermfiber and 3M caulking and provide floor plate.

C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Fire protection sleeves may be flush with floor of stairways.

END OF SECTION

SECTION 15075 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Access panel and door markers.
4. Pipe markers.
5. Duct markers.
6. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

a. Manufacturer, product name, model number, and serial number.
b. Capacity, operating and power characteristics, and essential data.
c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.
2. Data:

a. Name and plan number.
b. Equipment service.
c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers, with numbering scheme [approved by Architect] <Insert other>. Provide 5/32-inch (4-mm) hole for fastener.
   1. Material: 3/32-inch- (2.4-mm-) thick laminated plastic with 2 black surfaces and white inner layer.
   2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
   1. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   2. Heat exchangers, coils, evaporators, and similar equipment.
   3. Fans, blowers, primary balancing dampers, and mixing boxes.
   4. Packaged HVAC central-station and zone-type units.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

   1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
   3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:

      a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
      b. Fire department hose valves and hose stations.
      c. Meters, gages, thermometers, and similar units.
      d. Pumps, compressors, chillers, condensers, and similar motor-driven units.
      e. Heat exchangers, coils, evaporators, and similar equipment.

f. Fans, blowers, primary balancing dampers, and mixing boxes.
g. Packaged HVAC central-station and zone-type units.
h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:

a. Green: For cooling equipment and components.
b. Yellow: For heating equipment and components.
c. Orange: For combination cooling and heating equipment and components.

2. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:

a. Main control and operating valves, including safety devices.
b. Pumps, compressors, chillers, condensers, and similar motor-driven units.
c. Heat exchangers, coils, evaporators, and similar equipment.
d. Fans, blowers, primary balancing dampers, and mixing boxes.
e. Packaged HVAC central-station and zone-type units.
f. Tanks and pressure vessels.
g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Pretensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.
4. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 1-1/2 inches (38 mm), round.
   b. Hot Water: 1-1/2 inches (38 mm), round.
   c. Fire Protection: 2 inches (50 mm), round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Fire Protection: Red.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: White.
   c. Fire Protection: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

CLEANING

B. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 15081 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 7 Sections for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Division 15 Section "Pipe Insulation" for insulation for piping systems.
3. Division 15 Section "Metal Ducts" for duct liner.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

B. Deliver and store all insulation with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

C. Any installed insulation left temporarily incomplete shall be covered with protective material until final connections can be installed.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.
b. Knauf FiberGlass GmbH.
c. Owens-Corning Fiberglas Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

2.4 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
2. Install anchor pins and speed washers on sides and bottom of horizontal ducts and all sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.

3. Impale insulation over anchors and attach speed washers.
4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
7. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round duct elbows with individually mitered gores cut to fit the elbow.
8. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
9. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply-, return-, exhaust and outside-air ductwork.
2. Indoor exposed supply-, return-, exhaust and outside-air ductwork.
3. Indoor concealed range-hood exhaust ductwork.
4. Indoor concealed dishwasher ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Factory-insulated flexible ducts.
2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
3. Flexible connectors.
4. Vibration-control devices.
5. Testing agency labels and stamps.
6. Nameplates and data plates.
7. Access panels and doors in air-distribution systems.

3.6 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round and rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.

B. Service: Round and rectangular, return-air and exhaust ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.

C. Service: Round and rectangular, outside-air ducts, concealed and exposed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.

D. Service: Round and rectangular, supply and return-air ducts, exposed.

1. Material: Mineral-fiber glass, R-Value 4 of greater, density 3.0lbs/c.f.
2. Thickness: Double wall ductwork
3. Number of Layers: One.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.

E. Service: Round and rectangular, return-air ducts drops to space:

1.Type D6: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, ‘k’ value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity.

.

END OF SECTION

SECTION 15083 - PIPE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:
   1. Division 2 for loose-fill pipe insulation in underground piping outside the building.
   2. Division 7 for firestopping materials and requirements for penetrations through fire and smoke barriers.
   3. Division 15 Section "Duct Insulation" for insulation for ducts and plenums.
   4. Division 15 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
   5. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:
   a. CertainTeed Manson.
   b. Knauf FiberGlass GmbH.
   c. Owens-Corning Fiberglas Corp.
   d. Schuller International, Inc.

2. Cellular-Glass Insulation:
   a. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

3. Flexible Elastomeric Thermal Insulation:
   a. Armstrong World Industries, Inc.
   b. Rubatex Corp.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

   a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.

   b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Closed-Cell Phenolic-Foam Insulation: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.

D. Flexible Elastomeric Thermal Insulation used on Refrigerant Piping: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

D. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth finish, 0.010 inch (0.25 mm) thick.
2. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

E. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
1. Products:
   a. Pittsburgh Corning Corporation; Pittwrap.
   b. Polyguard; Insulrap No Torch 125.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

1. Aluminum: 0.007 inch (0.18 mm) thick.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation

without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer’s recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:
1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow vale operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer’s attachments and accessories. Seal seams with tape and vapor-retarder mastic.

4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.6 CLOSED-CELL PHENOLIC-FOAM INSUALTION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply metal jacket where indicated, with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.9 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Fire-suppression piping.
3. Drainage piping located in crawl spaces, unless otherwise indicated.
4. Below-grade piping, unless otherwise indicated.
5. Chrome-plated pipes and fittings, unless potential for personnel injury.
6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.10 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber
3. Insulation Thickness: 1” thick
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: No
6. Finish: None.

B. Service: Rainwater conductors and roof drain bodies.

1. Operating Temperature: 32 to 100 deg F
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1” thickness
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Condensate and equipment drain piping.

1. Operating Temperature: 40 to 60 deg F
2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
3. Insulation Thickness: 3/4”
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No.
6. Finish: Two coats of the insulation manufacturer’s recommended protective coating.

D. Service: Chilled-water supply and return.

1. Operating Temperature: 35 to 75 deg F
2. Insulation Material: Pre-insulated piping, or Cellular glass, with jacket or Closed-cell phenolic foam.
3. Insulation Thickness, Cellular glass: Apply the following insulation thickness:
   a. Steel Pipe, 1.5” and smaller: 1.5”
   b. Steel Pipe, 2” to 12”: 2”
4. Insulation Thickness, Closed-cell phenolic foam: Apply the following insulation thicknesses:
   a. Steel Pipe, 1.5” and smaller: 1”
   b. Steel Pipe, 2” to 4”: 1.5”
   c. Steel Pipe, 5” to 12”: 2”
5. Field-Applied Jacket: PVC on exposed ceiling , Aluminum Jacket on all exterior,
6. Vapor Retarder Required: Yes.
7. Finish: None.

E. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

F. Service: Domestic water piping.

1. Operating Temperature: 60 to 80 deg F
2. Insulation Material: Mineral Fiber
3. Insulation Thickness: 1” thick.
4. Field-Applied Jacket: Foil and Paper(ASJ)
5. Vapor Retarder Required: Yes.
6. Finish: None.

G. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).

1. Operating Temperature: 35 to 90 deg F
2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
3. Insulation Thickness: larger of 1” or mfr’s recommendations.
4. Field-Applied Jacket: scrim reinforced foil
5. Vapor Retarder Required: None.
6. Finish: None.

3.11 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses: 1”

4. Field-Applied Jacket: Aluminum.
5. Vapor Retarder Required: Yes.
6. Finish: None.

B. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses: ½”
4. Field-Applied Jacket: Aluminum
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Chilled-water supply and return.

1. Operating Temperature: 35 to 75 deg F
2. Insulation Material: Pre-insulated piping, or Cellular glass, with jacket or Closed-cell phenolic foam.
3. Insulation Thickness, Cellular glass: Apply the following insulation thickness:
   a. Steel Pipe, 1.5” and smaller: 1.5”
   b. Steel Pipe, 2” to 12”: 2”
4. Insulation Thickness, Closed-cell phenolic foam: Apply the following insulation thicknesses:
   a. Steel Pipe, 1.5” and smaller: 1”
   b. Steel Pipe, 2” to 4”: 1.5”
   c. Steel Pipe, 5” to 12”: 2”
5. Field-Applied Jacket: Aluminum
6. Vapor Retarder Required: Yes.
7. Finish: None.

END OF SECTION

SECTION 15110 - VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following general-duty valves:
   1. Copper-alloy ball valves.
   2. Bronze check valves.
   3. Bronze gate valves.
   4. Cast-iron gate valves.

B. Related Sections include the following:

   1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
   2. Division 13 fire-suppression piping and fire pump Sections for fire-protection valves.
   3. Division 15 Section "Mechanical Identification" for valve tags and charts.
   4. Division 15 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:

   1. CWP: Cold working pressure.
   2. EPDM: Ethylene-propylene-diene terpolymer rubber.
   3. NBR: Acrylonitrile-butadiene rubber.
   4. PTFE: Polytetrafluoroethylene plastic.
   5. SWP: Steam working pressure.
   6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.

   1. Exceptions: , sanitary waste, and storm drainage piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Grinnell Corporation.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red-White Valve Corp.
g. Watts Industries, Inc.; Water Products Div.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:
1. Handwheel: For valves other than quarter-turn types.
2. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.

a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.

2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Copper-Alloy Ball Valves, General: MSS SP-110.

B. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum] [600-psig (4140-kPa)] CWP rating.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

2.4 BRONZE CHECK VALVES

A. Bronze Check Valves, General: MSS SP-80.

B. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

C. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

2.5 BRONZE GATE VALVES

A. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

B. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

2.6 CAST-IRON GATE VALVES

A. Cast-Iron Gate Valves, General: MSS SP-70, Type I.

B. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.

C. Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

2.7 CAST-IRON PLUG VALVES

A. Cast-Iron Plug Valves, General: MSS SP-78.

B. Class 125 or 150, lubricated-type, cast-iron plug valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, gate, or plug valves.
2. Throttling Service: Ball, butterfly, or globe valves.
3. Pump Discharge: Swing check, lift-disc check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Chilled-Water Piping: Use the following types of valves:
   1. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 400-psig (2760-kPa) CWP rating, copper alloy.
   2. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Flanged, [150-psig (1035-kPa)] [175-psig (1207-kPa)] CWP rating, ferrous alloy, with EPDM liner.
   3. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) CWP rating.

D. Domestic Water Piping: Use the following types of valves:
   1. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, [400-psig (2760-kPa)]CWP rating, copper alloy.
   2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
   3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class [125] [150], bronze.
   4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
   5. Gate Valves, NPS 2 (DN 50) and Smaller: Type [1] [2], Class 150] , bronze.
   6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

CONTROL VALVES

1. Provide 3-way control valve packages on each of the chilled water units.
2. Provide balancing valves and circuit setters on each of the chilled water units.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

END OF SECTION

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.

B. Related Sections include the following:

1. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

C. PVC: Polyvinyl chloride plastic.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Distribution Piping: 125 psig (860 kPa).

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.

C. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBING

A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.3 PVC PIPING

A. PVC Schedule 40 Pipe:

2.4 VALVES

A. Refer to Division 15 Section "Valves" for bronze and cast-iron, general-duty valves.

B. Refer to Division 15 Section "Plumbing Specialties" for balancing and drain valves.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.

E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:

1. NPS 1-1/2 (DN 40) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

2. NPS 2 (DN 50): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

3. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

4. NPS 4 to NPS 6 (DN 100 to DN150): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

F. Underground Domestic Water Piping NPS 4 (DN 100) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints. Water service larger than NPS 4 shall be PVC.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

3.4 PIPING INSTALLATION

A. Refer to Division 2 for site water distribution and service piping.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.

D. Install underground copper tubing according to CDA's "Copper Tube Handbook."

E. Install underground PVC piping according to ASTM D 2774 and ASTM F 645. Install buried piping inside building between wall and floor penetrations and connection to water service piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

G. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

H. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.

I. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.

J. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

K. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

L. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

3.5 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 VALVE INSTALLATION

A. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

B. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 15 Section "Plumbing Specialties" for calibrated balancing valves.

3.7 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod
2. NPS 1 and NPS-1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10mm) Rod.

3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13 mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13 mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

G. Install supports for vertical copper tubing every 10 feet (3m).

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.9 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

2. Adjust calibrated balancing valves to flows indicated.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.

B. Related Sections include the following:
   1. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:
   1. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

   1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings: For sovent drainage system, include plans, elevations, sections, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 PVC PIPING

A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:

1. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. NPS 2 to NPS 4 (DN 50 to DN 100): PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. NPS 5 and NPS 6 (DN 125 and DN 150): Use NPS 6 (DN 150) PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:

1. NPS 2 to NPS 4 (DN 50 to DN 100): PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. NPS 5 and NPS 6 (DN 125 and DN 150): PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Refer to Division 2 Section "Sanitary Sewerage" for Project-site sanitary sewer piping.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep ¼ bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8- bend fittings if 2 fixture are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24 hour period of subjected to exterior water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.

I. Install soil and waste drainage and vent piping at the code required minimum slopes, unless otherwise indicated:

J. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

L. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

M. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with ½-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with ¾-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): (1200 mm) with 7/8-inch (22-mm) rod.

K. Install supports for vertical PVC piping every 48 inches (1200 mm).

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer’s written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

B. Related Sections include the following:

1. Division 7 for roof curbs, piping supports, and roof penetration boots.
2. Division 7 for materials and methods for sealing pipe penetrations through fire and smoke barriers.
3. Division 7 for materials and methods for sealing pipe penetrations through exterior walls.
4. Division 15 Section "Hangers and Supports" for pipe supports and installation requirements.
5. Division 15 Section "Mechanical Identification" for labeling and identifying refrigerant piping.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.

1. Refrigerant piping indicated is schematic only. Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.

C. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

B. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

C. UL Standard: Provide products complying with UL standards.

1.5 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 7 for materials and methods for sealing pipe penetrations through fire and smoke barriers.

E. Coordinate pipe fitting pressure classes with products specified in related Sections.

1.6 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. Filter-Dryer Cartridges: One of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Refrigerants:

a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
b. DuPont Company; Fluorochemicals Div.
c. Elf Atochem North America, Inc.; Fluorocarbon Div.
d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.

2. Refrigerant Valves and Specialties:

a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
b. Danfoss Electronics, Inc.
c. Emerson Electric Company; Alco Controls Div.
d. Henry Valve Company.
e. Sporlan Valve Company.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B 280, Type ACR.

B. Annealed-Temper Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A).

C. Wrought-Copper Fittings: ASME B16.22.

D. Wrought-Copper Unions: ASME B16.22.

E. Bronze Filler Metals: AWS A5.8, Classification BAg-2 (silver)

2.3 VALVES

A. Diaphragm Packless Valves: 500-psig (3450-kPa) working pressure and 275 deg F (135 deg C) working temperature; globe design with straight-through or angle pattern; forged-brass or bronze body and bonnet, phosphor bronze and stainless-steel diaphragms, rising stem and handwheel, stainless-steel spring, nylon seat disc, and with solder-end connections.

B. Service Valves: 500-psig (3450-kPa) pressure rating; forged-brass body with copper stubs, brass caps, removable valve core, integral ball check valve, and with solder-end connections.

C. Solenoid Valves: Comply with ARI standards; 250 deg F (121 deg C) temperature rating and 400-psig (2760-kPa) working pressure; forged brass, with polytetrafluoroethylene valve seat, 2-way, straight-through pattern, and solder-end connections; manual operator; fitted with suitable NEMA 250 enclosure of type required by location, with 1/2-inch (16-GRC) conduit adapter and 24 V, normally open holding coil.

D. Pressure Relief Valves: Straight-through or angle pattern, brass body and disc, neoprene seat, and factory sealed and ASME labeled for standard pressure setting.

E. Thermostatic Expansion Valves: Comply with ARI standards; brass body with stainless-steel parts; thermostatic-adjustable, modulating type; size and operating characteristics as recommended by manufacturer of evaporator, and factory set for superheat requirements; solder-end connections; with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.

2.4 REFRIGERANT PIPING SPECIALITIES

A. Moisture/Liquid Indicators: 500-psig (3450-kPa) maximum working pressure and 200 deg F (93 deg C) operating temperature; all-brass body with replaceable, polished, optical viewing window with color-coded moisture indicator; with solder-end connections.

B. Permanent Filter-Dryer: 350-psig (2410-kPa) maximum operating pressure and 225 deg F (107 deg C) maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

2.5 REFRIGERANTS

A. ASHRAE 34, R-22: Monochlorodifluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, within Building: Type ACR drawn-copper tubing.

B. Belowground for NPS 2 (DN 50) and Smaller: Type K (Type A) annealed-copper tubing.

3.2 VALVE APPLICATIONS

A. Install packed-angle valve in liquid line between receiver shutoff valve and thermostatic expansion valve for system charging.

B. Install diaphragm packless valves on each side of strainers and dryers, in liquid and suction lines at evaporators, and elsewhere as indicated.

C. Install solenoid valves upstream from each expansion valve.

1. Install solenoid valves in horizontal lines with coil at top.
2. Electrical wiring for solenoid valves is specified in Division 16 Sections. Coordinate electrical requirements and connections.

D. Install thermostatic expansion valves as close as possible to evaporator.

1. If refrigerant distributors are used, install them directly on expansion-valve outlet.
2. Install valve so diaphragm case is warmer than bulb.
3. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
4. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

E. Install pressure-regulating and pressure relief valves as required by ASHRAE 15. Pipe pressure relief valve discharge to outside.

3.3 SPECIALTY APPLICATIONS

A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.

B. Install strainers immediately upstream from each automatic valve, including expansion valves, solenoid valves.

C. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.

D. Install pressure relief valves on ASME receivers; pipe discharge to outdoors.

E. Install permanent filter-dryers in low-temperature systems, in systems using hermetic compressors, and before each solenoid valve.

F. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

G. Install receivers, sized to accommodate pump-down charge, on systems 5 tons (17.5 kW) and larger and on systems with long piping runs.

H. Install flexible connectors at or near compressors where piping configuration does not absorb vibration.

3.4 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

C. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

D. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

F. Belowground, install copper tubing in protective conduit. Vent conduit outdoors.

G. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

H. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. Install bypass around moisture-liquid indicators in lines larger than NPS 2 (DN 50).

J. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

K. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

L. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."

M. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6.0 m) long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6.0 m) or longer.
3. Pipe rollers for multiple horizontal runs 20 feet (6.0 m) or longer, supported by a trapeze.

N. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

O. Support vertical runs at each floor.

3.5 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 15 Section "Basic Mechanical Materials and Methods."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.6 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME standards.

1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.

    a. System shall maintain test pressure at the manifold gage throughout duration of test.
    b. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
    c. Fill system with nitrogen to raise a test pressure of 150 psig (1035 kPa) or higher as required by authorities having jurisdiction.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Check compressor oil level above center of sight glass.
2. Open refrigerant valves, except bypass valves that are used for other purposes.

3.8 CLEANING

A. Before installing copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.9 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install filter-dryer but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
4. Charge system. Provide full-operating charge.

END OF SECTION 15183

SECTION 15190 – SYSTEM IDENTIFICATION AND PIPE MARKING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 15050, are included as a part of this Section as though written in full in this document.

1.02 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

1.03 Refer to Architectural Sections for additional requirements.

PART 2 - PRODUCTS

2.01 VALVE AND PIPE IDENTIFICATION

A. Valves:

1. All valves shall be identified with a 1-1/2" diameter brass disc wired onto the handle. The disc shall be stamped with 1/2" high depressed black filled identifying numbers. These numbers shall be numerically sequenced for all valves on the job.

2. The number and description indicating make, size, model number and service of each valve shall be listed in proper operational sequence, properly typewritten. Three copies to be turned over to Owner at completion.

3. Tags shall be fastened with approved meter seal and 4 ply 0.018 smooth copper wire. Tags and fastenings shall be manufactured by the Seton Name Plate Company or approved equal.

4. All valves shall be numbered serially with all valves of any one system and/or trade grouped together.

B. Pipe Marking:

1. All interior visible piping located in accessible spaces such as above accessible ceilings, equipment rooms, attic space, under floor spaces, etc., shall be identified with all temperature pipe markers as manufactured by W.H. Brady Company, 431 West Rock Ave., New Haven, Connecticut, or approved equal.

2. All exterior visible piping shall be identified with UV and acid resistant outdoor grade acrylic plastic markers as manufactured by Set Mark distributed by Seton nameplate company. Factory location 20 Thompson Road, Branford, Connecticut, or approved equal.

3. Generally, markers shall be located on each side of each partition, on each side of each tee, on each side of each valve and/or valve group, on each side of each piece of equipment, and, for straight runs, at equally spaced intervals not to

exceed 75 feet. In congested area, marks shall be placed on each pipe at the points where it enters and leaves the area and at the point of connection of each piece of equipment and automatic control valve. All markers shall have directional arrows.

4. Markers shall be installed after final painting of all piping and equipment and in such a manner that they are visible from the normal maintenance position. Manufacturer's installation instructions shall be closely followed.

5. Markers shall be colored as indicated below per ANSI/OSHA Standards:

SYSTEM	COLOR	LEGEND
Chilled Water	Green	Chilled Water Supply Chilled Water Return
Sanitary Sewer	Green	Vent Sanitary Sewer
Storm Drain	Green	Storm Drain
Domestic Water	Green	Domestic Water
Domestic Hot Water Supply	Yellow	Domestic Hot Water Supply
Domestic Hot Water Recirculating	Yellow	Domestic Hot Water Return
Fire Protection	Red	Fire Protection
Automatic Sprinkler	Red	Fire Sprinkler
Gas	Yellow	Natural Gas
Condenser Water	Green	Condenser Water Supply Condenser Water Return
Compressed Air	Blue	Compressed Air
Pneumatic Control	Yellow	Pneumatic Control
Oxygen	Yellow	Oxygen
Nitrogen	Green	Nitrogen
Deionized Water	Green	Deionized Water
Steam	Yellow	Steam Supply Steam Return

C. Pipe Painting:

1. All piping exposed to view shall be painted as indicated or as directed by the Architect in the field. Confirm all color selections with Architect prior
2. to installation.

3. The entire fire protection piping system shall be painted red.

4. All piping located in mechanical rooms and exterior piping shall be painted as indicated below:

System	Color
Storm Sewer	White
Sanitary Sewer Waste and Vent	Light Gray
Domestic Cold Water	Dark Blue
Domestic Hot Water Supply and Return	Orange
Condenser Water Supply and Return	Light Green
Gas	Yellow
Chilled Water Supply and Return	Light Blue
Heating Hot Water Supply and Return	Reddish Orange

PART 3 - EXECUTION

3.01 All labeling equipment shall be installed as per manufacturers printed installation instructions.

3.02 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors price shall include all items required as per manufacturers' requirements.

3.03 All piping shall be cleaned of rust, dirt, oil and all other contaminants prior to painting. Install primer and a quality latex paint over all surfaces of pipe.

END OF SECTION

SECTION 15240 - SOUND AND VIBRATION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Vibration and sound control products.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division One specification sections, apply to work of this section

B. This section is Division-15 Basic Materials and Methods section, and is part of each Division-15 section making reference to vibration control products specified herein.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration control products, of type, size, and capacity required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Vibration and sound control products shall conform to ASHRAE criteria for average noise criteria curves for all equipment at full load conditions.

C. Except as otherwise indicated, sound and vibration control products shall be provided by a single manufacturer.

1.04 SUBMITTALS

A. SHOP DRAWINGS: Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

B. PRODUCT DATA: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Amber/Booth Company, Inc.

B. Mason Industries, Inc.

C. Kenetics Noise Control.

2.02 GENERAL

A. Provide vibration isolation supports for equipment, piping and ductwork, to prevent transmission of vibration and noise to the building structures that may cause discomfort to the occupants.

B. Model numbers of Amber/Booth products are included for identification. Products of the additional manufacturers will be acceptable provided they comply with all of the requirements of this specification.

2.03 FLOOR MOUNTED AIR HANDLING UNITS

A. Provide Amber/Booth XLW-2, style C aluminum housed isolators sized for 2" static deflection. Cast iron or steel housings may be used provided they are hot-dip galvanized after fabrication

B. If floor mounted air handling units are furnished with internal vibration isolation option, provide 2" thick Amber/Booth type NRC ribbed neoprene pads to address high frequency breakout and afford additional unit elevation for condensate drains. Ribbed neoprene pads shall be located in accordance with the air handling unit manufacturer's recommendations.

2.04 SUSPENDED AIR HANDLING UNITS

A. Provide Amber/Booth type BSWR-2 combination spring and rubber-in-shear isolation hanger sized for 2'' static deflection.

B. If suspended air handling units are furnished with internal vibration isolation option, furnish Amber/Booth type BRD rubber-in-shear or NR AMPAD 3/8'' thick neoprene pad isolation hangers sized for approximately ½'' deflection to address high frequency break-out.

2.05 SUSPENDED FANS AND FAN COIL UNITS

A. Provide Amber/Booth type BSS spring hangers sized for 1'' static deflection.

2.06 BASE MOUNTED PUMPS AND CHILLERS

A. Amber/Booth type SP-NR style E flexplate pad isolators consisting of two layers of 3/8'' thick alternate ribbed neoprene pad bonded to a 16 gage galvanized steel separator plate.

B. Pads shall be sized for approximately 40 PSI loading and 1/8'' deflection.

2.07 PIPING

A. Provide spring and rubber-in-shear hangers, Amber/Booth type BSR in mechanical equipment rooms, for a minimum distance of 50 feet from isolated equipment for all chilled water and hot water piping 1-1/2'' diameter and larger. Springs shall be sized for 1'' deflection.

B. Floor supported piping is required to be isolated with Amber/Booth type SW-1 open springs sized for 1'' deflection.

C. Furnish line size flexible connectors at supply and return of pumps, amber/booth style 2800 single sphere EPDM construction, connector shall include 150 lb. cadmium plated carbon steel floating flanges.

2.08 CORROSION PROTECTION

A. All vibration isolators shall be designed and treated for resistance to corrosion.

B. Steel components: PVC coated or phosphated and painted with industrial grade enamel. Nuts, bolts, and washers: zinc-electroplated.

PART 3 - EXECUTION

3.01 All equipment shall be installed in accordance with the manufacturers recommendations and printed installation instructions.

3.02 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items required as per manufacturers requirements.

3.03 If internal isolation option is used on air handling units, the mechanical contractor shall verify proper adjustment and operation of isolators prior to start-up. All shipping brackets and temporary restraint devices shall be removed.

3.04 The vibration isolation supplier shall certify in writing that he has inspected the installation and that all external isolation materials and devices are installed correctly and functioning properly.

END OF SECTION

SECTION 15330 - WET PIPE FIRE PROTECTION SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.

B. The Basic Materials and Methods, Section 15050, are included as a part of this Section as though written in full in this document.

1.02 SCOPE

A. Scope of the work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

1.03 REGULATORY CODES

A. Work in accordance with:

1. NFPA.
2. Local municipal codes that have jurisdiction.

B. Products in accordance with:

1. United Laboratories (UL) listed.
2. Factory Mutual (FM) approved.

1.04 CERTIFICATE OF TESTING

A. Furnish Owner with test certificate certifying the system approved by:

1. City Fire Marshall.

2. Insurance Services Officials (ISO)

PART 2 - PRODUCTS

2.01 FIRE SPRINKLER SYSTEM

A. GENERAL:

1. Work Included:
   a. Design, coordination and installation of inside piping only, including sprinkler heads, valves, hangers and supports sleeves.
   b. The sprinkler system is a wet type and is designed to provide coverage for the entire new building (ref. plans) The Contract Drawings indicate the extent and general arrangement, and the various occupancy classifications.
   c. Sprinkler heads shall be concealed type and brass uprights.
   d. The plans provide a preliminary layout with riser assembly location, flow switch locations, valve locations. These are a guide for subsequent preparation of the Contractor's detailed working drawings.
   e. Interface system with fire alarm syste.
2. Quality Assurance: Equipment and installation to meet requirements of NFPA Number 13, latest edition and local authority having jurisdiction. All components

of the completed system shall be UL listed for the intended service.

2.02 SUBMITTALS:

A. Submit shop drawings in accordance with Section 15050.

B. Submit preliminary layout showing only head locations for review by Architect/Engineer. Furnish additional heads which may be required for coordinated ceiling pattern without added cost, even though number of heads may exceed minimum code requirements.

C. Submit shop drawings of entire sprinkler system including hydraulic calculations to Architect/Engineer.

D. Provide Architect with six complete sets of final approved shop drawings before starting the installation. Include details of the sprinkler system showing sections, light fixtures, air conditioning, ducts, and a plan giving fire department connections, location of all exposed structures within twenty feet of this structure, and other equipment to be used. Drawings shall bear the stamp of review of the local fire insurance rating organization having jurisdiction.

E. Service Utility Diagram: Furnish Architect with an accurately marked print showing location of underground pipes and valves as installed upon completion of underground Work.

F. Provide a printed sheet giving brief instructions relative to all necessary aspects of sprinkler controls and emergency procedures next to sprinkler riser mains. Instruction sheet to be protected by glass or a transparent plastic cover.

G. Materials:

1. Above Ground Piping:
   a. All piping above grade shall be:
      - schedule 10 black steel pipe with a rolled groove ends, joined with mechanical coupling and cut groove cast iron fittings for pipe 2-1/2” and greater.
      - schedule 40 black steel threaded pipe and fittings for pipe 2” and smaller.
   b. Acceptable manufacturer:
      - American Tube
      - Wheatland Tube
      - Gem Sprinkler
      - All piping shall be by a domestic manufacturer.
   c. Acceptable mechanical coupling manufacturer:
      - Victaulic
      - Grinnell
   d. All fire main outlets to be welded:
      - NO Mechanical Tees will be allowed.

2. Underground Ground Piping:
   e. All piping below grade shall be:
      - C900 PVC / DR-14 with "FIRE LINE" warning ribbons 12 above pipe
      - Stainless Steel in-building rises

3. Sprinkler Heads:
   a. Suspended Ceiling Type: Concealed pendant type
   b. Exposed Area Type: Standard upright type with brass finish
   c. Sidewall Type: Chrome plated finish with matching escutcheon.

d. Temperature rating on fusible links to suit specific hazard area with minimum margin or safety 50 degrees F.
e. Sprinkler heads of the “O”-ring seal type are not acceptable.
f. .
g. Flexible type sprinkler head connection systems are not acceptable.
h. Acceptable manufacturer:
- Reliable
- Grinnell
- Viking
- Tyco

4. Sprinkler Alarm Valve:
a. Provide approved automatic sprinkler valve with one or two pole (as required) flow detectors, pressure switch, outside electric gongs, and inside electric gong and circuit breaker.
b. Acceptable manufacturer:
- Reliable
- Grinnell
- Viking
- Tyco

5. Valves:
a. 2” and smaller: bronze, rising stem, inside screw, solid wedge, U.L. listed valve.
b. 2-1/2” and larger: iron body, bronze trim, rising stem, OS&Y, solid wedge, U.L. listed valve.
c. Check valve: cast iron flanged body, bronze fitted, non-slam type.
d. Install valves with stems upright or horizontal, not inverted.
e. Acceptable manufacturer:
- Nibco
- Grinnell
- Stockham
- Victaulic

6. Fire Department Connection:
a. Per Fire Departments requirements
b. 2.5" Siemese with Knox Caps

PART 3 - EXECUTION

3.01 All equipment shall be installed in accordance with the manufacturer’s recommendations and printed installation instructions.

3.02 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Provide all items as required by NFPA and installed as per manufacturer’s recommendations.

3.03 DESIGN

A. Design spacing of sprinkler heads and selection sizes shall conform to the requirement of NFPA 13 for the indicated occupancy.

B. Uniform discharge density design shall be based on hydraulic calculations utilizing the method outlined in NFPA 13. Density of discharge from sprinkler heads shall conform with NFPA 13.

C. Friction losses in pipe will be based on a value of "C" =120 in the Hazen - Williams formula.

D. Design and install the system so that no part will interfere with doors, windows, heating,

plumbing, or electrical equipment. Do not locate sprinkler heads within 6 inches of lighting fixtures, HVAC diffusers and other obstructions. Sprinkler piping cannot penetrate ductwork or lighting fixtures.

E. The Contractor shall conform to the National Fire Protection Association's Fire Code No. 13, latest edition. Special attention shall be given to Article 1-9, working plans. It shall be the Registered Fire Protection Engineer's responsibility to determine if any deficiency or deviations, such as an inadequate water supply, or any other item which would materially affect the acceptability of the system.

3.04 INSTALLATION

A. Install all items in accordance with applicable codes.

B. Install piping so that mains and branches are not located directly underneath HVAC equipment or other items needing access.

C. All sprinkler heads shall be located as near the center of ceiling tiles as is practical (±1/2"). Location shall present a uniform pattern with all heads aligned when completely installed.

D. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads. Exact routing of piping shall be approved by Architect or relocated as required at no additional cost to Owner.

E. Wire guards on all pendant or upright sprinkler heads in mechanical rooms, gymnasiums, athletic areas, wood and metal shops.

F. Protect sprinkler heads against mechanical injury with standard guards.

G. Locate outside alarms on wall of building adjacent to siamese fire department connection.

H. Provide on wall near sprinkler valve, cabinet containing four extra sprinkler heads of each type and wrench suitable for each head type.

I. Provide 1 inch diameter nipple and 1 inch x 1/2 inch reducing fitting for each upright head.

J. Painting shall be as follows:

1. Exposed sprinkler riser, alarm valve and all related piping shall be painted red.
2. Exposed sprinkler piping in finished areas shall be painted as directed by Architect.

3.05 REPLACEMENT

Upon receipt of written notice of failure of any part of the guaranteed equipment during the guaranteed period, the Contractor will replace the affected part or parts promptly at no additional cost.

3.06 TESTING

A. Prior to testing, the entire sprinkler system shall be thoroughly flushed clean.

B. Upon completion of the installation and flushing, test the system and obtain approval of

the local fire insurance rating organization having jurisdiction. Particular attention is called to the requirements of NFPA 13 pamphlet.

3.07 TRAINING

A. Owner's people shall be fully briefed in the normal start-up of the system, operation, normal and emergency shutdown, and maintenance of the system.

B. Routine maintenance, yearly maintenance, winterization, and spring start-up shall be fully discussed and documented.

C. Names of those instructed and dates, as well as a list of information handed over to the owner, shall be included in the final report.

END OF SECTION

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing fixtures and related components.

B. Related Sections include the following:
   1. Division 15 Section "Drinking Fountains and Water Coolers."
   2. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

   1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

2.2 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Products:

a. American Standard.
b. Eljer.
c. Kohler.

2.3 SHOWER FAUCETS

A. Shower Faucet: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
1. Manufacturers:

a. American Standard.
b. Eljber.
c. Kohler.

2.4 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
1. Manufacturers:

a. American Standard.
b. Eljer
c. Kohler.

2.5 TOILET SEATS

A. Toilet Seat: Solid plastic.
   1. Manufacturers:
      a. Bemis.
      b. Beneke.
      c. Centoco.
      d. Church.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Guard, Manufactured, plastic enclosure for covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
   1. Manufacturers:
      a. Engineered Brass Co.
      b. Plumerex
      c. Truebro.

2.7 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible and standard mounting heights. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
   1. Manufacturers:
      a. Mifab
      b. Josam.
      c. Wade.
      d. Zurn

B. Urinal Support: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.
   1. Manufacturers:
      a. Josam.
      b. J.R. Smith
      c. Zurn.
   2. Accessible Fixture Support: Include rectangular steel uprights.

C. Lavatory Support: Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
   1. Manufacturers:
      a. Josam.
      b. J.R. Smith
      c. Zurn.
   2. Accessible Fixture Support: Include rectangular steel uprights.

D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
1. Manufacturers:

a. Josam.
b. J.R. Smith
c. Zurn.

2.8 WATER CLOSETS

A. Water Closets: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

B. Water Closets: Accessible, floor mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

2.9 URINALS

A. Urinals,: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. TOTO USA, Inc.

2.10 LAVATORIES, SINKS

A. Lavatories,: Accessible, wall hanging, vitreous-china fixture.
1. Products:

a. American Standard, Inc.
b. Kohler Co.
c. Toto

2.11 KITCHEN SINKS

A. Kitchen Sinks: Commercial, counter-mounting, stainless-steel fixture.
1. Products:

a. Elkay Manufacturing Co.
b. Just Manufacturing Co.

2.12 SERVICE SINKS

A. Service Sinks: Floor-mounting, enameled, sink with front apron, raised back, and coated, wire rim guard.
   1. Products:

      a. Commercial Enameling Co.
      b. Kohler Co.
      c. Fiat

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

S. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15415 - DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Drinking fountains.
2. Self-contained water coolers.
3. Fixture supports.

1.3 DEFINITIONS

A. Accessible Drinking Fountain and Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

C. Fitting: Device that controls flow of water into or out of fixture.

D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.

E. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" about fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

E. TAS: Texas Accessibility Standards.

1.6 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified below.

1. Elkay.
2. Halsey Taylor.
3. Haws Corporation.

2.2 DRINKING FOUNTAINS

A. Drinking Fountains,: Accessible, Style W, wall-hanging fixture made of stainless steel.

1. Receptor Shape: Rectangular.
2. Back Panel: Stainless-steel wall plate behind drinking fountain.
3. Bubblers: Two, with automatic stream regulator, located on deck.
4. Control: Push button.
5. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve.
6. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
7. Support: Type I, water-cooler carrier. Refer to "Fixture Supports" Article.

2.3 SELF-CONTAINED WATER COOLERS

A. Water Coolers: Accessible, ARI 1010, Type PB, pressure with bubbler, Style W, wall-hanging fixture.

1. Cabinet: Bilevel with two attached cabinets, enameled steel with stainless-steel top.
2. Bubbler: One, with automatic stream regulator, located on each cabinet deck.
3. Control: Push button.
4. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve and filter.
5. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.

6. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    a. Capacity: 8 gph (0.0084 L/s) of 50 deg F (10 deg C) cooled water from 80 deg F (27 deg C) inlet water and 90 deg F (32 deg C) ambient air temperature.
    b. Electrical Characteristics: 1/5 hp; 120-V ac; single phase; 60 Hz.

7. Support: Type II, water-cooler carrier. Refer to "Fixture Supports" Article.

2.4 FIXTURE SUPPORTS

A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, water-cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Available Manufacturers:
2. Manufacturers:

    a. Josam Co.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe; Wade Div.
    d. Zurn Specifications Drainage Operation.

3. Type I: Hanger-type carrier with two vertical uprights.
4. Type II: Bilevel, hanger-type carrier with three vertical uprights.
5. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

C. Install fixtures level and plumb.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.

G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 for sealant and installation requirements.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following plumbing specialties:
1. Balancing valves.
2. Washer-supply outlets.
3. Key-operation hydrants.
4. Trap seal primer valves.
5. Drain valves.
6. Miscellaneous piping specialties.
7. Sleeve penetration systems.
8. Flashing materials.
9. Cleanouts.
10. Floor drains.
11. Roof drains.
12. Grease interceptors.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig (860 kPa).
2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
3. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
1. Balancing valves.
2. Water hammer arresters and trap seal primer valves and systems.

3. Hose bibbs, hydrants.
4. Washer-supply outlets.
5. Cleanouts, floor drains, and roof drains.
6. Roof flashing assemblies.
7. Grease interceptors.
8. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

PART 2 - PRODUCTS

2.1 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
1. Manufacturers:

a. Armstrong Pumps, Inc.
b. Flow Design, Inc.
c. ITT Industries; Bell & Gossett Div.
d. Taco, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

4. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) mininmum CWP. Include two-piece, copper-alloy body with full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Manufacturers:

a. Conbraco Industries, Inc.
b. Crane Co., Crane Valve Group; Crane Valves.
c. Grinnell Corporation.
d. NIBCO INC.
e. Red-White Valve Corp.

2.2 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

2.3 OUTLET BOXES

A. Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Symmons Industries, Inc.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:

1. Box and Faceplate: [Stainless steel] [Enameled or epoxy-painted steel].
2. Shutoff Fitting: Two hose bibbs.
3. Supply Fittings: Two NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
4. Drain: NPS 2 (DN 50) standpipe, P-trap, and direct waste connection to drainage piping.
5. Inlet Hoses: Two ASTM D 3571, 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female hose-thread couplings.
6. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

D. Icemaker Outlet Boxes: With hose connection and the following:

1. Box and Faceplate: Stainless steel.
2. Shutoff Fitting: Hose bibb.
3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.4 KEY-OPERATION HYDRANTS

A. Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Woodford Manufacturing Co.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa).

1. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) threaded or solder joint.
2. Outlet: ASME B1.20.7, garden-hose threads.
3. Operating Keys: One with each key-operation hydrant.

C. Moderate-Climate, Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral nonremovable hose-connection vacuum breaker, and concealed outlet.

1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.

D. Hot and Cold, Nonfreeze Concealed-Outlet Wall Hydrants: With deep flush-mounting box with cover; hot- and cold-water casings and operating rods to match wall thickness; concealed outlet; wall clamps; and factory- or field-installed, nonremovable and manual drain-type, hose-connection vacuum breaker complying with ASSE 1011.

2.5 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. Manufacturers:

a. Josam Co.
b. MIFAB Manufacturing, Inc.
c. Precision Plumbing Products, Inc.
d. Smith, Jay R. Mfg. Co.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.6 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
   1. Manufacturers:

      a. Josam Co.
      b. Smith, Jay R. Mfg. Co.
      c. Tyler Pipe; Wade Div.
      d. Zurn Industries, Inc.; Specification Drainage Operation.

B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

C. Roof Flashing Assemblies: Manufactured assembly made of [4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-)] [6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-)] thick, lead flashing collar and skirt extending at least [6 inches (150 mm)] [8 inches (200 mm)] [10 inches (250 mm)] from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

G. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

H. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

2.7 SLEEVE PENETRATION SYSTEMS

A. Manufacturers:

   1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

   1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

    a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.8 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.9 CLEANOUTS

A. Cleanouts: Comply with [ASME A112.36.2M] [ASME A112.3.1] <Insert other>.

1. Application: [Floor cleanout] [Wall cleanout] [For installation in exposed piping].
2. Products:
    a. Josam Co.
    b. Mifab
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe, Wade Div.
    e. Zurn Industries, Inc., Specification Drainage Operation.

2.10 FLOOR DRAINS

A. Floor Drains.
1. Products:

    a. Josam Co.
    b. Mifab
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe, Wade Div.
    e. Zurn Industries, Inc.

2.11 ROOF DRAINS

A. Roof Drains: Comply with [ASME A112.21.2M] [ASME A112.3.1].

1. Application: Roof drain.
2. Products:

a. Josam Co.
b. Mifab
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe, Wade Div.
e. Watts Industries, Inc., Drainage Products Div.
f. Zurn Industries, Inc.

2.12 GREASE INTERCEPTORS

A. Grease Interceptors: Comply with PDI-G101.
1. Products:

a. American Industrial Precast Products, Inc.
b. Brooks Products
c. Park Equipment Co.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

C. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

D. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

E. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

F. Install expansion joints on vertical risers, stacks, and conductors if indicated.

G. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.

4. Locate at base of each vertical soil and waste stack.

H. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

I. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

J. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

K. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.

M. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

N. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

O. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Flush with In-Ground Installation: Set unit and extension, if required, with cover flush with finished grade.
2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

P. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

Q. Fasten recessed-type plumbing specialties to reinforcement built into walls.

R. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

S. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

T. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect plumbing specialties to piping specified in other Division 15 Sections.

D. Ground equipment.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15485 - ELECTRIC, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for domestic water systems:

1. Tankless, electric water heaters.
2. Commercial, electric water heaters.
3. Compression tanks.
4. Accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.

D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Point-of-Use, Tankless, Electric Water Heaters:

a. Chronomite Laboratories, Inc.
b. Eemax

2. Commercial, Point-of-Use, Storage, Electric Water Heaters:

a. Rheem
b. State Industries.

3. Commercial, Storage, Electric Water Heaters:

a. Lochinvar Corp.
b. PVI Industries, Inc.
c. State Industries.

4. Water Heater Stand and Drain Pan Units:

a. Safety: W. H. Safety Products, Inc.

5. Compression Tanks:
a. Bell & Gossett
b. Taco, Inc.
c. Zurn Industries, Inc.; Wilkins Div.

2.2 POINT-OF-USE, TANKLESS, ELECTRIC WATER HEATERS

A. Description: Comply with UL 499.

B. Construction: Without hot-water storage.

1. Working-Pressure Rating: 150 psig (1035 kPa).
2. Tappings: ASME B1.20.1, pipe thread.
3. Interior Finish: Materials complying with NSF 61, barrier materials for potable-water tank linings.
4. Jacket: Aluminum or steel, with enameled finish, or plastic.

C. Heating System: Electric-resistance type.

1. Temperature Control: Adjustable thermostat.
2. Safety Control: Automatic, high-temperature-limit cutoff device or system.

D. Mounting: Bracket or device for wall mounting.

2.3 COMMERCIAL, POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS (6 TO 40 GALLON)

A. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.

B. Storage Tank Construction: Non-ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

C. Heating Elements: Two, unless otherwise indicated; electric, screw-in, immersion type.

1. Temperature Control: Adjustable thermostat.

D. Anode Rod: Factory installed, magnesium.

E. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

F. Special Requirement: NSF 5 construction.

2.4 COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS (OVER 40 GALLONS)

A. Description: Comply with UL 1453.

B. Storage Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, pressure gage, thermometer, drain, anode rods, and controls as required. Attach tappings to tank shell before testing and labeling.

    a. NPS 2 (DN50) and Smaller: Threaded ends according to ASME B1.20.1, pipe threads.

2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

C. Heating Elements: Electric, screw-in or bolt-on, immersion type arranged in multiples of three.

1. Exception: Water heaters up to 9-kW input may have 2 or 3 elements.
2. Staging: Input not exceeding 18 kW per step.
3. Temperature Control: Adjustable surface-mounted thermostat.
4. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

D. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

E. Anode Rods: Factory installed, magnesium.

F. Dip Tube: Factory installed. Not required if cold-water inlet is near bottom of storage tank.

G. Special Requirement: NSF 5 construction.

2.5 COMPRESSION TANKS

A. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

B. Construction: 150-psig (1035-kPa) working-pressure rating.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

D. Tank Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

E. Tank Exterior Finish: Manufacturer's standard, unless finish is indicated.

F. Air-Charging Valve: Factory installed.

2.6 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

B. Vacuum Relief Valves: Comply with ASME PTC 25.3. Furnish for installation in piping.

1. Exception: Omit if water heater has integral vacuum-relieving device.

C. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

D. Water Heater Stands: Water heater manufacturer's factory-fabricated, steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.

E. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated, steel bracket for wall mounting and capable of supporting water heater and water.

F. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN20).

PART 3 - EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated. Refer to Division 3 and Division 15 Section "Basic Mechanical Materials and Methods."

3.2 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.

B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

D. Install vacuum relief valves in cold-water-inlet piping.

E. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for drain valves.

F. Install thermometers on water heater inlet and outlet piping

1. Exception: Omit thermometers for the following:

a. Commercial, point-of-use, water heater inlet piping.
b. Water heater with thermometer outlet piping.

G. Fill water heaters with water.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.

D. Make connections with dielectric fittings where piping is made of dissimilar metal.

E. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.

F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL Standards.

3.4 FIELD QUALITY CONTROL

A. In addition to manufacturer's written installation and startup checks, perform the following:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of circulators.
6. Test operation of safety controls, relief valves, and devices.
7. Energize electric circuits.
8. Adjust operating controls.
9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F (60 deg C) unless piping system application requires higher temperature.
10. Balance water flow through manifolds of multiple-unit installations.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

1. Train Owner's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.
2. Review data in maintenance manuals. Refer to Division 1.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15801 – VARIABLE CAPACITY INDOOR AIR HANDLING UNITS

Part 1 - General

1.01 Related Documents

1.02 General Description

A. This section includes the design, controls, and installation requirements for indoor air handling units.

1.03 Quality Assurance

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

1.04 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.05 Delivery, Storage, and Handling

A. Unit shall be wrapped in plastic prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be handled carefully to avoid damage to components, enclosures and finish.

D. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.06 Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant

b. ECM driven direct drive backward curved plenum supply fans
c. Double wall cabinet construction
d. Insulation with a minimum R-value of 6.25
e. Double sloped stainless steel drain pans
f. Hinged access doors with lockable handles
g. Designed, engineered, and manufactured in the United States of America
h. All other provisions of the specifications must be satisfactorily addressed

2.02 Air Handling Units

A. General Description

1. Indoor air handling units shall include filters, supply fans,DX evaporator coil,reheat coil,electric heaters,and unit controls.
2. Unit shall have a draw-through supply fan configuration and discharge air vertically.
3. Unit shall be factory assembled and tested includingleak testing of the DX coil,and run testing of the supply fans and factory wired electrical system. Run test report shall be supplied with the unit.
4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
5. Unit components shall be labeled, includingpipe stub outs,refrigeration system components andelectrical and controls components.
6. Installation, Operation and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Access to filters,cooling coil,reheat coil,supply fans, and electrical and controls components shall be through hinged access doors.
6. Access doors shall be flush mounted to cabinetry. Coil access door and supply fan access door shall include quarter-turn lockable handles. Supply fan access door shall include removable pin hinges.
7. Units with a cooling coil shall include sloped 304 stainless steel drain pan. Drain pan connection shall be on the right hand side of unit.

8. Cooling coil shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

C. Electrical

1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.
2. Unit shall include a factory installed 24V control circuit transformer.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blower and motor assembly shall be dynamically balanced.
3. Blower and motor assembly shall be mounted on rubber isolators.
4. Motor shall be a high efficiency electronically commutated motor (ECM).

E. Cooling Coil

1. Evaporator Coil
   a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
   b. Coil shall two circuits and interlaced circuitry.
   c. Coil shall be 6 row high capacity and 12 fins per inch.
   d. Coil shall be hydrogen or helium leak tested.
   e. Coil shall be furnished with factory installed thermostatic expansion valves.The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.
   f. Coil shall have right hand external piping connections. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing, and be factory sealed on both the interior and exterior of the unit casing, to minimize air leakage.

F. Refrigeration System

1. Air handling unit and matching condensing unit shall be capable of operation as an R-410A split system air conditioner.
2. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.
3. Modulating hot gas reheat shall be provided on the lead refrigeration circuit. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. Modulating reheat valves shall be factory installed in the matching AAON condensing unit. Reheat line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.

TAG

G. Electric Heating

1. Unit shall include an electric heater consisting of electric heating coils, fuses, and a high temperature limit switch, with capacities as shown on the plans.

2. Electric heating coils shall be located in the reheat position downstream of the supply fan.
3. Electric heater shall have full modulation capacity controlled by an SCR (Silicon Controlled Rectifier). Controller shall provide the heating control signal to control the amount of heating.

H. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.

I. Controls

1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.
2. Factory Installed and Factory Provided Controller
   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.
   b. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
   c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
   d. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
   e. Make Up Air Controller
      1. Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.
      2. Hot gas bypass shall be required on the lead refrigeration circuits of systems without variable capacity compressors.
      3. Unit shall modulate heating with constant airflow to meet ventilation outside air loads. Heating capacity shall modulate based on supply air temperature.
   f. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [WattMaster Orion Controls System]

Part 3 - Execution

3.01 Installation, Operation and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

SECTION 15802 – VARIABLE CAPACITY AIR COOLED CONDENSING UNITS

Part 1 - General

1.01 Related Documents

1.02 General Description

A. This section includes the design, controls and installation requirements for air-cooled condensers / condensing units.

1.03 Quality Assurance

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. System Seasonal Energy Efficiency Ratio/Energy Efficiency Ratio (SEER/EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

1.04 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.05 Delivery, Storage, and Handling

A. Unit shall be shipped with doors bolted shut to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.06 Warranty

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance and refrigerant.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Desert Aire
3. Munters
4. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Hinged access doors with lockable handles
   c. Variable capacity compressor with 10-100% capacity
   d. Designed, engineered, and manufactured in the United States of America
   e. All other provisions of the specifications must be satisfactorily addressed

2.02 Condensing Units

A. General Description

1. Condensing unit shall include compressors, air-cooled condenser coils, condenser fans, suction and liquid connection valves, and unit controls.
2. Condenser shall include air-cooled condenser coils, condenser fans, discharge and liquid connection valves, and unit controls.
3. Unit shall be factory assembled and tested including leak testing of the coil and run testing of the completed unit. Run test report shall be supplied with the unit in the controls compartment's literature pocket.
4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
5. Unit components shall be labeled, including split system piping stub outs, refrigeration system components and electrical and controls components.
6. Installation, Operation and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction

1. Unit shall be completely factory assembled, piped, wired and shipped in one section.
2. Unit shall be specifically designed for outdoor application.

3. Access to compressors and controls components shall be through hinged access doors with quarter turn, lockable handles.

4. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

5. Unit shall include lifting lugs.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.

2. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage provided to the unit.

3. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more that 10% out of balance on voltage, the voltage is more that 10% under design voltage, or on phase reversal.

D. Refrigeration System

1. Compressors shall be R-410A scroll type with thermal overload protection, individually circuited and carry a 1 year non-prorated warranty, from the date of original equipment shipment from the factory. Each compressor shall be furnished with a crankcase heater.

2. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged access doors shall provide access to the compressors.

3. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of sound from the compressors into the building area.

4. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and service valves for liquid and suction connections. Liquid line filter driers shall be factory provided. Finished field installed refrigerant circuits shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line insulated hot gas line and insulated suction line.

5. Unit shall include a factory holding charge of R-410A refrigerant and oil.

6. Each capacity stage shall be equipped with a 5 minute off delay timer to prevent compressor short cycling. Each capacity stage shall be equipped with an adjustable 20 second delay timer to prevent multiple capacity stages from starting simultaneously.

7. The unit shall be capable of stable cooling operation to a minimum of 55°F outdoor temperature.

8. Compressors shall carry a 5 year non-prorated warranty from the date of original equipment shipment from the factory.

9. All refrigeration circuits shall include a 10-100% variable capacity compressor.

10. Lead refrigeration circuit shall be provided with hot gas reheat coil in the matching air handler, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

11. Electronically commutated motor driven (Variable frequency drive controlled) variable speed condenser fans shall be provided for head pressure control and allow operation down to 25°F.

E. Condensers

1. Air-Cooled Condenser

a. Condenser fans shall be vertical or horizontal discharge, axial flow, direct drive fans.

b. Fan motor shall be weather protected, single phase, direct drive, and open drip proof with inherent overload protection.

c. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

d. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

e. Coils shall be hydrogen or helium leak tested.

f. Coil shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6,000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year warranty, from the date of original equipment shipment from the factory.

F. Controls

1. Standard Terminal Block

a. Unit shall be provided with a terminal block for field installation of controls. Option shall include factory installed isolation relays.

Part 3 - Execution

3.01 Installation, Start Up, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Factory Authorized Representative shall provide on-site Start Up of the rooftop package unit and associated controls. A startup report shall be provided detailing the completion of work and initial settings. Startup and startup report to the owner shall include the following items.

i. Electrical Power

ii. Condenser Fans

iii. Compressors

iv. Crankcase Heaters

v. Controls.

D. Installing Contractor will schedule start up appointment with Factory Authorized Representative.

E. Factory Authorized Representative shall be located within 40 miles of jobsite.

F. Factory Authorized Service Technician shall be located within 40 miles of jobsite.

3.02 Training

A. Factory Authorized Representative shall provide on-site training to the owner. Training shall cover operation and maintenance of the package unit and all factory provide control items. The owner shall schedule the time and date directly with the Factory Authorized Representative.

SECTION 15815 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2490 Pa).

B. Related Sections include the following:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.

2. Division 15 Section "Diffusers, Registers, and Grilles."

3. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect.

1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Duct layout indicating pressure classifications and sizes on plans.

2. Fittings.

3. Penetrations through fire-rated and other partitions.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.

2. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Duct Construction Standards: Provide a copy of the duct construction standards to be used for each pressure classification in this project. Duct Construction Standards must comply with the latest edition of SMACNA “HVAC Duct Construction Standards – Metal and Flexible.”

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation

D. Deliver and store all ductwork with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

E. Any installed ductwork or piping system left temporarily incomplete shall be covered with protective material until final connections can be installed.

F. All ductwork and/or liner insulation to be wrapped with protective material until installation. Any ductwork or insulation left exposed to the environment or contaminating particulate matter shall be replaced at the contractor’s expense.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Comply with latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Fabricate range hood exhaust ducts with 0.0598-inch- (1.5-mm-) thick, galvanized sheet for concealed ducts and 0.0500-inch- (1.3-mm-) thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.

C. Fabricate dishwasher hood exhaust ducts with 0.0500-inch- (1.3-mm-) thick stainless steel. Weld and flange seams and joints.

D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:

1. Supply Ducts between AHU and Air Terminal Units: 3-inch wg (750 Pa).

2. Supply Ducts after air terminal units and on constant volume supply equipment: 1-inch wg (250 Pa), positive pressure

3. Return Ducts: 1-inch wg (500 Pa), negative pressure.

4. Exhaust Ducts: 1-inch wg (500 Pa), negative pressure.

E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of unbraced panel area, unless ducts are lined.

2.5 ROUND FABRICATION

A. Round Ducts: Fabricate spiral seam supply and return ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Snap Lock Longitudinal seam ductwork will not be allowed. Adjustable elbows will not be allowed.

B. Spiral seam round or oval duct may be substituted for rectangular duct at the contractors option. Spiral seam ductwork sizing must result in the same or less pressure drop than the rectangular duct indicated on the plans.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round ducts in lengths not less than 10 feet (3 m), unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Sections.

3.2 RANGE HOOD EXHAUST DUCT INSTALLATIONS

A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F (1100 deg C) temperature range.

B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at 15-foot (4.6-m) intervals; locate on sides of duct a minimum of 1-1/2 inches (38 mm) from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies.

3.3 DISHWASHER EXHAUST DUCT INSTALLATIONS

A. Install dishwasher exhaust ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.4 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." All duct to be sealed to SMACNA seal class A which requires sealing all tranverse joints, longitudinal seams and duct wall penetratrions regardless of pressure classification.

B. Seal externally insulated ducts before insulation installation.

C. All ducts shall be inspected after sealing is complete and prior to insulation installation. Provide the engineer with a minimum 7 days notice prior to beginning duct insulation.

3.5 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet (5 m) and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.6 CONNECTIONS

A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.7 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. 25% of the duct installed after the air handling units and prior to the air terminal units shall be tested in the presence of the Architect, at static pressures equal to maximum design pressure of system or section being tested. The sections of duct to be tested shall be chosen by the architect or engineer after installation of the duct. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg (500 to 2490 Pa).

E. Remake leaking joints and retest until leakage is less than maximum allowable.

3.8 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

END OF SECTION

SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounted access doors and panels.
6. Flexible ducts.
7. Flexible connectors.
8. Duct accessory hardware.

B. Related Sections include the following:

1. Division 8 Sections for wall- and ceiling-mounted access doors and panels.
2. Division 10 Sections for intake and relief louvers and vents connected to ducts and installed in exterior walls.
3. Division 15 Section "Diffusers, Registers, and Grilles."
4. Division 16 Sections for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Fire dampers.
4. Duct-mounted access doors and panels.
5. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.

D. Blade Seals: Vinyl.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
3. Blade Axles: Galvanized steel.
4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555.

B. Fire Rating: One and one-half hours.

C. Fire Rating: One and one-half hours.

D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.

1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.

H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.

I. Fusible Link: Replaceable, 165 deg F (74 deg C) rated as indicated.

2.5 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.7 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

2.8 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Polyethylene film.
3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.9 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.

1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to Division 15 Section "Mechanical Identification."

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 15837 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes centrifugal fans and vent sets.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA standards.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each unit scheduled and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural support members and/or shaft locations.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cook, Loren Company.
2. Greenheck.

2.2 HOUSINGS

A. Roof Mounted Centrifugal Exhaust Fan.
1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

2.3 WHEELS

A. Roof Mounted Centrifugal Exhaust Fan
   1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

2.4 SHAFTS

A. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

B. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.

C. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

2.5 BEARINGS

A. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

   1. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.
   2. Roller-Bearing Rating Life: ABMA 11, L_{50} of 200,000 hours.

2.6 BELT DRIVES

A. Description: Factory mounted, with final alignment and belt adjustment made after installation.

   1. Service Factor Based on Fan Motor: 1.5.

B. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

C. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

D. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.

E. Motor Mount: Adjustable for belt tensioning.

2.7 ACCESSORIES

A. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.

B. Companion Flanges: Galvanized steel, for duct connections.

C. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.

D. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.

E. Spark-Resistant Construction: AMCA 99 (where required).

F. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

G. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.8 MOTORS

A. Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, high efficiency, Design B.

C. Enclosure Type: [Open dripproof] [Totally enclosed, fan cooled].

2.9 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Install units with clearances for service and maintenance.

C. Label fans according to requirements specified in Division 15 Section "Mechanical Identification."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15855 – AIR DEVICES (DIFFUSERS, REGISTERS, AND GRILLES)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 10 Sections for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
3. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Titus.
2. Price

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. . Coordinate device locations with ceiling grid, sprinklers, and lights. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

DIVISION 15990 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. CTI: Cooling Tower Institute.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

C. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications for larger projects: Engage a testing, adjusting, and balancing agent certified by AABC.

B. Agent Qualifications for smaller projects: Engage a testing, adjusting, and balancing agent certified by NEBB.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable) PART

3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 1.

D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine strainers for clean screens and proper perforations.

M. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine equipment for installation and for properly operating safety interlocks and controls.

O. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

P. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section.

B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

2. Measure static pressure across each air-handling unit component.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
4. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 VARIABLE-AIR-VOLUME SYSTEMS' ADDITIONAL PROCEDURES

A. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance systems similar to constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to design airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

C. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum design airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum design airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units being tested at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to design airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

3.7 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at design flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type, unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 HYDRONIC SYSTEMS' BALANCING PROCEDURES

A. Determine water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than design flow.

E. Adjust balancing stations to within specified tolerances of design flow rate as follows:

1. Determine the balancing station with the highest percentage over design flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures, including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.9 FLOW VARIABLE-FLOW HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

A. Systems installed with pressure independent control valves shall not require hydronic system balancing.

B. Systems installed with pressure independent valves shall require verification of flow for 25% of the total installed product. Exact locations of tested product to be coordinated with the design engineer.

3.10 PRIMARY-SECONDARY HYDRONIC SYSTEMS' ADDITIONAL PROCEDURES

A. Balance the primary system crossover flow first, then balance the secondary system.

3.11 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.12 CHILLERS

A. Balance water flow through each evaporator and condenser to within specified tolerances of design flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator water entering and leaving temperatures, pressure drop, and water flow.
2. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by the chiller manufacturer.
3. Power factor if factory-installed instrumentation is furnished for measuring kW.
4. The kW input if factory-installed instrumentation is furnished for measuring kW.
5. Capacity: Calculate in tons of cooling.
6. Air-Cooled Chillers: Verify condenser-fan rotation and record fan data, including number of fans and entering- and leaving-air temperatures.

3.13 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.14 HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperatures at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kW at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.15 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

3.16 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.17 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply and Exhaust Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.18 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:

a. Design versus final performance.
b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Settings for supply-air, static-pressure controller.
    g. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.

F. Mounted Air-Handling Unit Test Reports: For roof mounted air-handling units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches (mm), and bore.
    i. Number of belts, make, and size.
    j. Number of filters, type, and size.

2. Motor Data: Include the following:

    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

3. Test Data: Include design and actual values for the following:

    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Preheat coil static-pressure differential in inches wg (Pa).
    f. Cooling coil static-pressure differential in inches wg (Pa).
    g. Heating coil static-pressure differential in inches wg (Pa).
    h. Outside airflow in cfm (L/s).
    i. Return airflow in cfm (L/s).
    j. Outside-air damper position.
    k. Return-air damper position.

G. Electric-Coil Test Reports: For electric duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data: Include the following:

    a. System identification.
    b. Location.
    c. Coil identification.
    d. Capacity in Btuh (kW).
    e. Number of stages.
    f. Connected volts, phase, and hertz.
    g. Rated amperage.

2. Test Data: Include design and actual values for the following:

    a. Heat output in Btuh (kW).
    b. Airflow rate in cfm (L/s).
    c. Air velocity in fpm (m/s).
    d. Entering-air temperature in deg F (deg C).
    e. Leaving-air temperature in deg F (deg C).
    f. Voltage at each connection.
    g. Amperage for each phase.

H. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data: Include the following:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.

2. Motor Data: Include the following:

    a. Make and frame type and size.

b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

I. Air-Terminal-Device Reports: For terminal units, include the following:

1. Unit Data: Include the following:

a. System and air-handling unit identification.
b. Location and zone.
c. Area served.
d. Air-terminal-device make.
e. Air-terminal-device number from system diagram.
f. Air-terminal-device type and model number.
g. Air-terminal-device size.

2. Test Data: Include design and actual values for the following:

a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Space temperature in deg F (deg C).

J. Packaged Chiller Reports: For each chiller, include the following:

1. Unit Data: Include the following:

a. Unit identification.
b. Make and model number.
c. Manufacturer's serial number.
d. Refrigerant type and capacity in gal. (L).
e. Starter type and size.
f. Starter thermal protection size.

2. Condenser Test Data: Include design and actual values for the following:

a. Refrigerant pressure in psig (kPa).
b. Refrigerant temperature in deg F (deg C).
c. Entering-water temperature in deg F (deg C).
d. Leaving-water temperature in deg F (deg C).
e. Entering-water pressure in feet of head or psig (kPa).
f. Water pressure differential in feet of head or psig (kPa).

3. Evaporator Test Reports: Include design and actual values for the following:

    a. Refrigerant pressure in psig (kPa).
    b. Refrigerant temperature in deg F (deg C).
    c. Entering-water temperature in deg F (deg C).
    d. Leaving-water temperature in deg F (deg C).
    e. Entering-water pressure in feet of head or psig (kPa).
    f. Water pressure differential in feet of head or psig (kPa).

4. Compressor Test Data: Include design and actual values for the following:

    a. Make and model number.
    b. Manufacturer's serial number.
    c. Suction pressure in psig (kPa).
    d. Suction temperature in deg F (deg C).
    e. Discharge pressure in psig (kPa).
    f. Discharge temperature in deg F (deg C).
    g. Oil pressure in psig (kPa).
    h. Oil temperature in deg F (deg C).
    i. Voltage at each connection.
    j. Amperage for each phase.
    k. The kW input.
    l. Crankcase heater kW.
    m. Chilled water control set point in deg F (deg C).
    n. Condenser water control set point in deg F (deg C).
    o. Refrigerant low-pressure-cutoff set point in psig (kPa).
    p. Refrigerant high-pressure-cutoff set point in psig (kPa).

5. Refrigerant Test Data: Include design and actual values for the following:

    a. Oil level.
    b. Refrigerant level.
    c. Relief valve setting in psig (kPa).
    d. Unloader set points in psig (kPa).
    e. Percentage of cylinders unloaded.
    f. Bearing temperatures in deg F (deg C).
    g. Vane position.
    h. Low-temperature-cutoff set point in deg F (deg C).

K. Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Unit make and model number.
    d. Manufacturer's compressor serial numbers.
    e. Compressor make.
    f. Compressor model and serial numbers.
    g. Refrigerant weight in lb (kg).

2. Test Data: Include design and actual values for the following:
   a. Entering-air, dry-bulb temperature in deg F (deg C).
   b. Leaving-air, dry-bulb temperature in deg F (deg C).
   c. Control settings.
   d. Unloader set points.
   e. Low-pressure-cutout set point in psig (kPa).
   f. High-pressure-cutout set point in psig (kPa).
   g. Suction pressure in psig (kPa).
   h. Suction temperature in deg F (deg C).
   i. Condenser refrigerant pressure in psig (kPa).
   j. Condenser refrigerant temperature in deg F (deg C).
   k. Oil pressure in psig (kPa).
   l. Oil temperature in deg F (deg C).
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. The kW input.
   p. Number of fans.

L. Pump Test Reports: For pumps, include the following data. Calculate impeller size by plotting the shutoff head on pump curves.

1. Unit Data: Include the following:

   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model and serial numbers.
   f. Water flow rate in gpm (L/s).
   g. Water pressure differential in feet of head or psig (kPa).
   h. Required net positive suction head in feet of head or psig (kPa).
   i. Pump rpm.
   j. Impeller diameter in inches (mm).
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.
   n. Amperage for each phase.
   o. Full-load amperage and service factor.
   p. Seal type.

2. Test Data: Include design and actual values for the following:

   a. Static head in feet of head or psig (kPa).
   b. Pump shutoff pressure in feet of head or psig (kPa).
   c. Actual impeller size in inches (mm).
   d. Full-open flow rate in gpm (L/s).
   e. Full-open pressure in feet of head or psig (kPa).
   f. Final discharge pressure in feet of head or psig (kPa).
   g. Final suction pressure in feet of head or psig (kPa).
   h. Final total pressure in feet of head or psig (kPa).
   i. Final water flow rate in gpm (L/s).

j. Voltage at each connection.
k. Amperage for each phase.

3.19 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 16010 - SUMMARY OF ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

B. General Scope of Work:

1. Providing new panels, feeders, conduits, electrical meter, disconnect, combination starter/ disconnect, fire alarm, rough-in for telephone and data system, intercom system, and new light fixtures.

1.4 COORDINATION

A. All electrical work shall be done under sub-contract to a General Contractor. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.

B. Work shall take place with minimal disruption to Owner’s operations in areas surrounding the new building.

C. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

D. Fully coordinate with mechanical contractor for providing power to mechanical equipment.

1.5 UTILITIES

1. Coordinate with power company and provide conduit, and trenching from transformer to power source. Coordinate with water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
2. Obtain any approvals required from utilities to relocate utilities.
3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

1.6 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:

1. Temporary fencing around construction areas.
2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

1.7 SUBMITTALS

1. To extradite the submittal process more efficiently, do not piece-meal the submittals. Submit entire electrical in a bound enclosure. This will eliminate delays in the submittal process. Unbound submittals shall be returned without review. Submit 10 copies minimum.

END OF SECTION

SECTION 16020 - BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, Division 1 Specification Sections and all relevant documents shall form a part of this Division of the Specifications, and shall be incorporated in this Section and each Division 16 Section hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Division. Certain specific paragraphs of said references may be referred to hereinafter in this Division. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.

B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Division shall not be used as a basis for a request for additional compensation.

C. The specific features and details for other portions of the work related to the construction in progress or to the adjacent building shall be determined by examination at the site.

1.2 SCOPE OF WORK

A. The requirements contained in this Section apply to all work performed under Division 16 of these Specifications.

B. The work covered by this Division of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.

C. Refer to other Divisions of the Specifications for related work.

1.3 DEFINITION OF "CONTRACTOR"

A. Where the word "Contractor" is used under any Section of this Division of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section, even though this Contractor may be technically described as a Subcontractor, or an authorized representative.

B. If the Contractor, engaged to execute a portion of the work, employs a Subcontractor to perform some of that work, he shall be completely responsible for the proper execution of this Subcontractor’s work, in full conformity with the Contract Documents.

1.4 RESPONSIBILITY OF THE CONTRACTOR

A. The Contractor shall be responsible for all work of every description in connection with this Division of the Specifications. The Contractor shall specifically and distinctly assume, and does so assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.

B. The Contractor will be held responsible for the satisfactory execution and completion of the work in accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, the Contractor shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

1.5 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described be furnished, installed and connected under this Division, complete for operation, unless specifically noted to the contrary.

B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and devices described and specified under this Division of the Specifications be similarly furnished,

installed and connected under this Division, whether or not a phrase as described in the preceding paragraph has been actually included.

C. Whenever the words “Owner’s Representative” occurs, it is intended to refer to the Architect, Engineer and/or specific Owner’s Representative responsible for or capable of providing the necessary direction pertaining to the referenced issue.

1.6 ORDINANCES, PERMITS AND CODES

A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.

B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.

C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.

D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.

E. The work shall be in accordance with, but shall not be limited to, the requirements of:
   1 National Fire Protection Association
   2 National Electrical Code
   3 National Safety Code
   4 State of Texas Safety Code
   5. Local City Building Codes
   6. State of Texas Building Codes

F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

1.7 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION

A. Materials, equipment and devices shall be of the best quality customarily applied in quality commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

B. Materials, equipment and devices furnished under this Division of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.

C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.

D. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

1.8 QUALITY ASSURANCE

A. Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with those damaged, unless specifically approved otherwise by the Owner's Representative.

B. Wherever a UL standard has been established for a particular type of material, equipment or device, each item of such material, equipment or device provided on this project shall meet the

requirements of the UL standard in every way, and shall be UL listed and labeled.

1.9 REFERENCE STANDARDS

A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.

B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.

C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM - American Association of Battery Manufacturers
ADA - American's with Disabilities Act
AIA - American Institute of Architects
ANSI - American National Standards Institute
ASTM - American Society for Testing and Materials
CBM - Certified Ballast Manufacturers Association
ETL - Electrical Testing Laboratories
FM - Factory Mutual
ICEA - Insulated Cable Engineers Associated
IEEE - Institute of Electrical and Electronic Engineers
IES - Illuminating Engineering Society
IRI - Industrial Risk Insurance
NBS - National Bureau of Standards
NEC - National Electrical Code
NECA - National Electrical Contractors Association
NEMA - National Electrical Manufacturers Association
NESC - National Electrical Safety Code
NETA - National Electrical Testing Association
NFPA - National Fire Protection Association
UL - Underwriters Laboratories

□□□□□

1.10 DRAWINGS AND SPECIFICATIONS

A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:

1 The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.

2 The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.

B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though called for by both. Resolution of conflicts between Drawings and Specifications shall be as follows:

1 If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated for a complete operable system. Contractor is responsible to notifying the Architect and Engineer. In the event of this type of disagreement, the resolution shall be determined by the Owner's Representative. The contractor shall assume for an operable system at the most expensive combination as per the latest National Electrical Code. The contractor shall review all drawings and specifications prior to bid date.

2 The Contractor shall be responsible for bringing any conflicts in the Drawings and the Specifications to the attention of the Owner's Representative immediately, prior to bid

date.

3 In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.

4 Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.

5 Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.

6 Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.

C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.

D. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Owner's Representative for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.

E. Review the construction details of the building(s) as illustrated on the Drawings of the other portions of the work, i.e., architectural, structural, civil, landscape, etc., and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.

F. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements. Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. In cooperation with other Contractors, determine the exact location of equipment and devices and connections thereto by reference to the submittals and rough-in drawings, and by measurements at the site. Make minor relocations necessitated by the conditions at the site, or directed by the Owner's Representative, without additional cost to the Owner.

G. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings as required for all critical areas illustrating the installation of the work in this Division as related to the work of all other Divisions and correct all interferences with the other portions of the work or with the building structures before the work proceeds.

H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installation or installing any new or temporary work under this Division.

1.11 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 of the Specifications.

B. Process product data and shop drawings to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.

C. Submittals shall be provided for review and approval on all systems, equipment, devices and materials proposed for use on this project. Submittals shall include, but not be limited to, the following:

1 Lighting and Appliance Panelboards

2 Disconnect Switches

3 Circuit Breakers and Fuses

4 Materials: conduit, conductors, connectors, supports, etc.

5 Lighting Fixtures, Lamps and Control Systems/Devices
6 Wiring Devices
7 Transformers
8 Distribution Panelboards
9 Motor Control Center
10 As indicated on each submittal section

D. The product data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.

E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.

F. Assemble submittals on related items procured from a single manufacturer in bound brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.

G. Prepare shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Owner's Representative. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.

H. The Contractor shall sign the submittal as an indication of compliance with the Contract Documents. If there are any deviations from the Contract Documents, he shall so indicate on the submittal. Any deviations not so indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor’s expense.

1.12 SUBSTITUTIONS

A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.

B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.

C. Manufacturers not listed will be considered for substitution prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum seven (7) business days prior to bid with each sub-paragraph noted with the comment, "compliance", "deviation", "alternate" or “not applicable”. In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated.

1 By noting the term "compliance" or "C", it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.

2 By noting the term "deviation" or "D", it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.

3 By noting the term "alternate" or "A", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.

4 By noting the term “not applicable” or “N/A”, it shall be understood that the specified item is not applicable to the project.

D. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.

E. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Owner's Representative, install the equipment or devices to operate

properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.

F. The Owner's Representative reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.

G. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

1.13 INSTALLATION DRAWINGS

A. Prepare installation drawings for coordinating the work of this Division with the work of other Divisions, to illustrate its concealment in finished spaces, to avoid obstructions, and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.

B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not for approval, to the Owner's Representative for his information, review and record.

1.14 WORKMANSHIP AND INSTALLATION

A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.

B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about results of a first class condition.

C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

1.15 INSPECTION OF SITE

A. The accompanying drawings do not indicate existing installations other than to identify modifications of and extensions thereto. The Contractor shall visit the site, inspect the installations and ascertain the conditions to be met and the work to be performed. Failure to comply with this shall not constitute ground for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work under this Division.

B. Review construction details of the adjacent building presently under construction during the site inspection and include all work required to modify the existing installations and install new materials, comprising a part of the installation. Review all construction details of the new building as illustrated on the drawings and be guided thereby.

1.16 WARRANTY

A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Owner's Representative for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.

B. The Contractor shall furnish to the Owner's Representative for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

1.17 OPERATION PRIOR TO ACCEPTANCE

A. When any equipment is operable, and it is to the advantage of the Contractor to operate the

equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

1.18 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide the services of competent engineers and/or technicians acceptable to the Owner's Representative to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.

B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.

C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

1.19 SCHEDULE AND SEQUENCE OF WORK

A. The Contractor shall meet and cooperate with the Owner and Owner's Representative to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

1.20 INSTALLATION INSPECTIONS AND CERTIFICATIONS

A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.

B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Owner's Representative for transmission to the Owner.

1.21 EQUIPMENT INSTALLATION

A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.

B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.

C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

1.22 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for all floor mounted equipment, unless noted or required otherwise.

B. All pads shall be not less than 3-1/2" high and extend a maximum 3" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Pads shall be poured in forms built of new dressed lumber with corners chamfered using sheet metal or triangular wood strips nailed to the form. Use 6 x 6 No. 3 mesh for reinforcing. Install heavy duty adjustable anchor bolts, set in the form and positioned using templates, prior to pouring concrete. After the equipment is set on the pad, the equipment shall be aligned, leveled and fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.

C. Perform all concrete work specified to be provided under this Division in strict accordance with the applicable provisions of Division 3, CONCRETE.

1.23 SLEEVES

A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.

B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All

sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6 inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.

C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked and filled with an asphalt-base compound to insure a waterproof penetration. Jute twine caulking shall not be used due to susceptibility to termite infestation.

1.24 ESCUTCHEONS

A. In each finished space, provided a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.

B. Size escutcheons and collars to fit snugly around conduit and rods.

C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

1.25 ACCESS PANELS

A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable suspended ceilings.

B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

1.26 SEALING OF PENETRATIONS

A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:

1 Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).

2 Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.

3 Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.

B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove free liquid and oil from penetration surfaces.

C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.

D. In addition to the Dow Corning products, equal products by Spec Seal Firestop Products, 3M Fire Barrier or CS240 Firestop are acceptable.

1.27 PROTECTION OF APPARATUS

A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Owner's Representative will be sufficient cause for the rejection of the pieces of apparatus in question.

B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Division of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.

C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

1.28 INSTALLATION OF CONTROL AND OPERATING DEVICES

A. The highest operable part of controls (light switches, dimmer switches, emergency power off devices, etc.), receptacles (electrical and communications) and other operable devices shall be 48" above finish floor. The lowest operable part shall be no less than 15" above finished floor. For purposes of uniformity, unless noted otherwise, the top of a device shall be maximum 48" AFF and the bottom of a device shall be minimum 15" AFF. Refer to the electrical symbols list on the Drawings for specific requirements.

B. Visual alarm appliances shall be placed 80" above finished floor (the highest floor level within a space) or 6" below the ceiling, whichever is lower.

1.29 INSTALLATION AND CONNECTION OF OTHER DIVISION'S EQUIPMENT

A. Verify the electrical requirements of all equipment furnished under other Divisions, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. The location of power, data and telephone outlets, wall switches and other related devices may be relocated at the Owner's option, at no additional cost to the Owner, to a point within 10 feet of their present location provided the Contractor is notified prior to installation.

1.31 COOPERATION AND CLEAN-UP

A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the completion of the job, the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.

B. After the installation is complete, and before the equipment is energized, clean the interior and exterior of all equipment thoroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material removed. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with a lemon-oil rag after all other cleaning is complete.

C. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER

A. The Contractor shall obtain at his own expense a complete set of blueline prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The Contractor shall record up to date information at least once a week and retain the set of prints on site for periodic review by the Architect/Engineer. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. If the Contractor prepared large scale installation drawings of electrical rooms, conduit routing, busduct, routing, etc., these drawings or reproducible sepias therefrom shall be revised as required to accurately illustrate the actual installation. All conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location.

B. Upon anticipated completion of the job, obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these record drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. This information shall be delivered prior to final acceptance.

C. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the Owner's Representative for review and subsequent delivery to the Owner prior to final acceptance.

1 Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.
2 Approved lighting fixture brochures, wiring diagrams and control diagrams.
3 Copies of approved submittals and shop drawings.
4 Operating instructions and recommended maintenance procedures for major apparatus.
5 Copies of all other data and/or drawings required during construction.
6 Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.
7 Tag charts and diagrams hereinbefore specified.

1.33 FINAL OBSERVATION

A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.

B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Owner's Representative to make a final observation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Raceways.
   2. Building wire and connectors.
   3. Supporting devices for electrical components.
   4. Electrical identification.
   5. Electricity-metering components.
   6. Concrete equipment bases.
   7. Electrical demolition.
   8. Cutting and patching for electrical construction.
   9. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. FMC: Flexible metal conduit.
C. IMC: Intermediate metal conduit.
D. LFMC: Liquidtight flexible metal conduit.
E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For electricity-metering equipment.
B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
C. Coordinate electrical service connections to components furnished by utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
   2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
B. Meter Sockets: Comply with requirements of electrical power utility company.

C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.
   1. Housing: NEMA 250, Type 3R enclosure.
   2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity, minimum.

2.2 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.3 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.
   1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
   2. Space raceways laterally to prevent voids in concrete.
   3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
   4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
   5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) 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, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.
D. Selection of Supports: Comply with manufacturer's written instructions.
E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.
B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
I. Simultaneously install vertical conductor supports with conductors.
J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
    1. Wood: Fasten with wood screws or screw-type nails.
    2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
    3. New Concrete: Concrete inserts with machine screws and bolts.
    4. Existing Concrete: Expansion bolts.
    5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
    6. Steel: Welded threaded studs or spring-tension clamps on steel.
        a. Field Welding: Comply with AWS D1.1.
    7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
    8. Light Steel: Sheet-metal screws.
    9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
C. Self-Adhesive Identification Products: Clean surfaces before applying.
D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
3. Colors: As follows:
   a. Fire Alarm System: Red.
   b. Security System: Blue and yellow.
   c. Telecommunication System: Green and yellow.

E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.
4. Neutral: White.
5. Ground: Green.

H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: BROWN.
2. Phase B: ORANGE.
3. Phase C: YELLOW.
4. Neutral: White with a colored stripe or gray.
5. Ground: Green.

I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.7 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.8 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
   1. Raceways.
   2. Building wire and connectors.
   3. Supporting devices for electrical components.
   4. Electrical identification.
   5. Electricity-metering components.
   6. Concrete bases.
   7. Electrical demolition.
   8. Cutting and patching for electrical construction.
   9. Touchup painting.

B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
   1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
   2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
   3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
   4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
   5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.11 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16055 - SITE ELECTRICAL

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of all site electrical work.

B. The site electrical work shall include, but not be limited to, the furnishing and installation of necessary materials and making arrangements for:

1. The connection of electrical and telephone utilities.
2. Underground conduit.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PARTS 2 PRODUCTS.

1.4 REFERENCE STANDARDS

A. National Electrical Code (NEC), Article 300

B. Service installation standards of the serving utility company(s).

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE

A. Coordination: The location of the service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the electrical service. Contractor shall coordinate with the Power Company for all requirements prior to bid date. Contractor shall include all cost to for Utility Company to extend service to project site bid.

B. Materials: Provide materials in accordance with other Sections of these Specifications.

2.2 COMMUNICATION SERVICE

A. Coordination: The location of the telephone, cable, and internet service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the telephone, cable and internet services. Contractor shall coordinate with the Telephone , cable, and internet company for all requirements prior to bid date. Contractor is responsible to coordinate with utility companies.

B. Materials: Provide materials in accordance with other sections of this specification.

PART 3 EXECUTION

3.1 GENERAL

A. Underground installation of more than one conduit shall be in a duct arrangement as indicated. All conduits shall be laid so joints are staggered. All bends and stub-ups shall be rigid steel.

B. Pour a red colored concrete envelope 3" thick over utility service, emergency generator and fire pump conduits. Where conduits cross a driveway, road or parking area, reinforcing rods shall be installed.

C. Perform excavation, shoring, backfilling and concrete work in connection with electrical work in accordance with other Divisions of the Specifications.

D. All conduit shall be sloped away from the building to negate water entering the building through the conduit system.

3.2 UTILITIES

A. The locations, elevations and voltage of electrical lines and the location of the telephone lines included within the area of this work are indicated on the Drawings or in the Specifications in accordance with information received by the Architect/Engineer and Owner.

B. The Contractor shall examine the site and shall verify, to his own satisfaction, the location and elevation of all utilities, and shall adequately inform himself as to their relation to the work.

C. Existing utility lines not indicated but encountered during construction shall be protected, relocated or capped as directed by the Architect/Engineer. All precautions shall be exercised to prevent damage to existing lines not shown, but should work become necessary, it must be authorized prior to execution except in an emergency situation.

D. Before beginning excavations of any nature whatsoever, the Contractor shall make an attempt to locate all underground utilities of every nature occurring within the bounds of the area to be excavated. The

Contractor shall then proceed with caution in his excavation work so that no utility shall be damaged with a resultant loss of service.

E. Should a damage result to any utility through the Contractor's negligence or failure to comply with the above directive, he shall be liable for such damage and for all expense incurred in the expeditious repair or replacement of such damaged utilities.

F. Repair of damaged utilities shall be to a condition equal to or better than the adjacent undamaged portion of such utility and to the complete satisfaction of the Architect/Engineer and Owner.

END OF SECTION

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding and bonding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. Division 2 Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.
2. Chemical rods.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 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.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
    a. Apache Grounding/Erico Inc.
    b. Boggs, Inc.
    c. Chance/Hubbell.
    d. Copperweld Corp.
    e. Dossert Corp.
    f. Erico Inc.; Electrical Products Group.
    g. Framatome Connectors/Burndy Electrical.
    h. Galvan Industries, Inc.
    i. Hastings Fiber Glass Products, Inc.
    j. Ideal Industries, Inc.
    k. ILSCO.
    l. Kearney/Cooper Power Systems.
    m. Korns: C. C. Korns Co.; Division of Robroy Industries.
    n. Lightning Master Corp.
    o. Lyncole XIT Grounding.
    p. O-Z/Gedney Co.; a business of the EGS Electrical Group.

q. Raco, Inc.; Division of Hubbell.
r. Robbins Lightning, Inc.
s. Salisbury: W. H. Salisbury & Co.
t. Superior Grounding Systems, Inc.
u. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
B. Material: copper.
C. Equipment Grounding Conductors: Insulated with green-colored insulation.
D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
E. Grounding Electrode Conductors: Stranded cable.
F. Underground Conductors: stranded, unless otherwise indicated.
G. Copper Bonding Conductors: As follows:
1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
H. Ground Conductor and Conductor Protector for Wood Poles: As follows:
1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.
I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.
1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.
B. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.
C. Test Wells: Provide handholes as specified in Division 2 Section "Underground Ducts and Utility Structures."

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
B. In raceways, use insulated equipment grounding conductors.
C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

I. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

J. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding 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.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer.

Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

C. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Equipment Rated More Than 1000 kVA: 3 ohms.
    d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
    e. Manhole Grounds: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.6 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of electrical identification, including related accessories.

B. Provide electrical identification for the following:

1. Panelboards, motor starters, contactors, disconnect switches, circuit breakers and other electrical equipment with nameplate identifying the item of equipment and the equipment serving the same.
2. Raceways, junction boxes and pull boxes.
1. Label each panelboard index indicating the room #s to the related circuit. Also add the index sheet in a laminated white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.
3. Wiring devices.
4. Wiring.
5. Three phase motor rotation.

1.3 SUBMITTALS

A. Submit product data in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

B. Brady
C. Panduit
D. Thomas & Betts
E. Seton

2.2 IDENTIFICATION

A. Nameplates

1. Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.
2. Provide for each distribution panelboard, branch circuit panelboard, transformer and any other similar equipment furnished under this Division identification as to its given name, voltage and origination of service. Examples are as follows:

‘LB’	‘HD’
480Y/277V	480Y/277V
FED FROM ‘MDP’	FED FROM ‘MDP’

‘RDP’	‘TX-R’
208Y/120V	300 KVA, 480V to
FED FROM TX-R	208Y/120V
FED FROM ‘MDP’	

3. Provide for each motor starter enclosure, circuit breaker enclosure, disconnect switch and any other similar equipment furnished under this Division, identification as to the specific load that it serves and the origination of service. Examples are as follows:

‘CH-1'	‘AHU-1'
FED FROM ‘MDP'	FED FROM ‘DPA’

4. Provide for each feeder protective device in each distribution panelboard and any other similar equipment furnished under this Division, identification as to the specific load that it serves.

5. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

B. Junction Boxes and Pull Boxes
1. Identification shall be with a black permanent marking pen on the top of 4" x 4" junction box covers or on the back of an outlet box cover plate identifying the branch circuits and systems within the conduit. Pull boxes shall be provided with a nameplate stating voltage and system served.

C. Wiring Device Wall Plates
1. On the back side of wiring device wall plates identify with a black permanent marking pen the panelboard and branch circuit number the device is served from.

D. Wire Markers
1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.

F. Rotation Tags
1. Rotation tags shall be brass or aluminum securely attached to equipment.

PART 3 EXECUTION

3.1 PREPARATION
A. Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

3.2 NAMEPLATES
A. Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this Division.

3.3 WIRE MARKERS
A. Wire markers shall be applied to each conductor or cable within panelboards, motor starter enclosures, circuit breaker enclosures, disconnect switches, cabinets, junction boxes, pull boxes, and other similar equipment identifying the serving equipment and feeder or branch circuit from which the conductors originate.

END OF SECTION

SECTION 16120 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.
B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wires and Cables:
      a. American Insulated Wire Corp.; Leviton Manufacturing Co.
      b. BICC Brand-Rex Company.
      c. Carol Cable Co., Inc.
      d. Senator Wire & Cable Company.
      e. Southwire Company.
   2. Connectors for Wires and Cables:
      a. AMP Incorporated.
      b. General Signal; O-Z/Gedney Unit.
      c. Monogram Co.; AFC.
      d. Square D Co.; Anderson.
      e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
B. Rubber Insulation Material: Comply with NEMA WC 3.
C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
E. Conductor Material: Copper.
F. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.
G. Plenum rated cable for all cables above the ceiling.

2.3 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW or THWN, in raceway.
B. Feeders: Type 75C insulation THHN/THWN, in raceway.
C. Fire-Pump Feeder: Type MI, 3-conductor.
D. Branch Circuits: Type THHN/THWN, in raceway.
E. Fire Alarm Circuits: Type THHN/THWN, in raceway.
F. Class 1 Control Circuits: Type THHN/THWN, in raceway.
G. Class 2 Control Circuits: Type THHN/THWN, in raceway.
H. Equipment or any device rated 100 amperes or less, conductor shall be rated 60C as per National Electrical Code.
I. Equipment or any device rated over 100 amperes, conductor shall be rated 75C as per National Electrical Code.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
B. Remove existing wires from raceway before pulling in new wires and cables.
C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
F. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
H. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
I. Identify wires and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.
B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
C. Use splice and tap connectors compatible with conductor material.
D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.
F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
   1. Raceways include the following:
      a. RMC.
      b. IMC.
      c. PVC externally coated, rigid steel conduits.
      d. PVC externally coated, IMC.
      e. EMT.
      f. FMC.
      g. LFMC.
      h. LFNC.
      i. RNC.
      j. ENT.
      k. Wireways.
      l. Surface raceways.
   2. Boxes, enclosures, and cabinets include the following:
      a. Device boxes.
      b. Floor boxes.
      c. Outlet boxes.
      d. Pull and junction boxes.
      e. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:
   1. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
   2. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. ENT: Electrical nonmetallic tubing.
C. FMC: Flexible metal conduit.
D. IMC: Intermediate metal conduit.
E. LFMC: Liquidtight flexible metal conduit.
F. LFNC: Liquidtight flexible nonmetallic conduit.
G. RMC: Rigid metal conduit.
H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NECA's "Standard of Installation."

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Conduit and Tubing:
   a. Alflex Corp.
   b. Anamet, Inc.; Anaconda Metal Hose.
   c. Anixter Brothers, Inc.
   d. Carol Cable Co., Inc.
   e. Cole-Flex Corp.
   f. Electri-Flex Co.
   g. Flexcon, Inc.; Coleman Cable Systems, Inc.
   h. Grinnell Co.; Allied Tube and Conduit Div.
   i. Monogram Co.; AFC.
   j. Spiraduct, Inc.
   k. Triangle PWC, Inc.
   l. Wheatland Tube Co.
2. Nonmetallic Conduit and Tubing:
   a. Anamet, Inc.; Anaconda Metal Hose.
   b. Arnco Corp.
   c. Breeze-Illinois, Inc.
   d. Cantex Industries; Harsco Corp.
   e. Certainteed Corp.; Pipe & Plastics Group.
   f. Cole-Flex Corp.
   g. Condux International; Electrical Products.
   h. Electri-Flex Co.
   i. George-Ingraham Corp.
   j. Hubbell, Inc.; Raco, Inc.
   k. Lamson & Sessions; Carlon Electrical Products.
   l. R&G Sloan Manufacturing Co., Inc.
   m. Spiraduct, Inc.
   n. Thomas & Betts Corp.
3. Conduit Bodies and Fittings:
   a. American Electric; Construction Materials Group.
   b. Crouse-Hinds; Div. of Cooper Industries.
   c. Emerson Electric Co.; Appleton Electric Co.
   d. Hubbell, Inc.; Killark Electric Manufacturing Co.
   e. Lamson & Sessions; Carlon Electrical Products.
   f. O-Z/Gedney; Unit of General Signal.
   g. Scott Fetzer Co.; Adalet-PLM.
   h. Spring City Electrical Manufacturing Co.
4. Metal Wireways:
   a. Hoffman Engineering Co.
   b. Keystone/Rees, Inc.
   c. Square D Co.

2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.
   1. Fittings: Set-screw type.

E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING
- A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- C. LFNC: UL 1660.

2.4 METAL WIREWAYS
- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Screw – cover type flanged-and-gasketed type.
- E. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES
- A. Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.

2.6 PULL AND JUNCTION BOXES
- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.7 ENCLOSURES AND CABINETS
- A. 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.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS
- A. Outdoors: Use the following wiring methods:
  1. Exposed: Rigid steel.
  2. Concealed: Rigid steel.
  3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  6. Boxes and Enclosures: NEMA 250, Type 3R .
- B. Indoors: Use the following wiring methods:
  1. Exposed: EMT.
  2. Concealed: EMT.
  3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
  6. Damp or Wet Locations: Rigid steel conduit.
  7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
     a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

3.3 INSTALLATION
- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Minimum Raceway Size: 3/4-inch trade size (DN21).
- C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
E. Install raceways level and square and at proper elevations. Provide adequate headroom.
F. Complete raceway installation before starting conductor installation.
G. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
H. Use temporary closures to prevent foreign matter from entering raceways.
I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
M. Raceways Embedded in Slabs (Must be indicated on drawings to be embedded. Please notify Engineer if required but not shown): Install in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.
    1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
    2. Space raceways laterally to prevent voids in concrete.
    3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
    4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
    1. Run parallel or banked raceways together, on common supports where practical.
    2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
O. Join raceways with fittings designed and approved for the purpose and make joints tight.
    1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
    2. Use insulating bushings to protect conductors.
P. Tighten set screws of threadless fittings with suitable tools.
Q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
S. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.
T. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) 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.
U. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
    1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
    2. Where otherwise required by NFPA 70.
V. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Ex-

tend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

W. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

X. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.

Y. Do not install aluminum conduits embedded in or in contact with concrete.

Z. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.

1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.

BB. Set floor boxes level and adjust to finished floor surface.

CC. Set floor boxes level and trim after installation to fit flush to finished floor surface.

DD. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

EE. NO PVC CONDUIT ALLOWED ABOVE THE CEILING OR IN THE A/C RETURN PLENUM. PROVIDE RIGID CONDUIT. Verify all MEP documents.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFI: Ground-fault circuit interrupter.

B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Legends for receptacles and switch plates.

C. Samples: For devices and device plates for color selection and evaluation of technical features.

D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

B. Coordinate with pool contractor for special receptacles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc.

b. Eagle Electric Manufacturing Co., Inc.

c. Hubbell, Inc.; Wiring Devices Div.

d. Pass & Seymour/Legrand; Wiring Devices Div.

e. Pyle-National, Inc.; an Amphenol Co.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.

B. Special Receptacles for NEMA configuration refer to Manufacturer specs.

C. GFI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Device shall have an indicator light.

D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap. Device shall be white finish with the orange symbol.

1. Devices: Listed and labeled as isolated-ground receptacles.

2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 SWITCHES

A. General

1. Switches shall be toggle or decorative rocker type as indicated herein.. The body of the switch shall be made of an arc-resistant thermoset material. All toggle switch handles shall be constructed of a thermoplastic material. All rocker switch handles shall be constructed of a thermoset mate-

rial. All wall switches shall be of the quiet AC type.

1. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.
2. Switch color shall be white unless noted otherwise. Coordinate with Architect.

B. Specification Grade

1. Specification Grade switches shall be toggle type. The contact arms shall be made of one-piece copper alloy material. The switch shall include a green ground screw attached to the mounting strap. The switch shall be 20-ampere, 120/277-volts AC, horsepower rated, back and side-wired.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.
   1. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.
   2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide with “on/off” switch; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch (130-mm) wire connecting leads. Dimmer to be sized per circuit load.

2.4 WALL PLATES(All wall plates)

A. For all single and combination types match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.
   3. Material for Unfinished Spaces: stainless steel.

2.5 FLOOR SERVICE FITTINGS

A. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
B. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.
B. Install wall plates when painting is complete.
C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.
D. Do not share neutral conductor on load side of dimmers.
E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
F. Protect devices and assemblies during painting.
G. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."
B. Comply with Division 16 Section "Basic Electrical Materials and Methods."
   1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
   2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Division for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of supporting devices, including related systems and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

B. Unistrut Corp.

C. B-Line Systems, Inc.

D. Midland Ross-Kindorf

2.2 MATERIALS

A. Suspension Hangers

1.1 Suspension hangers for individual conduit runs shall be zinc plated formed steel type.

B. Vertical Supports

1.1 Malleable iron one hole pipe straps shall be used for vertical runs.

C. Clamps

1.1 Beam clamps shall be used for bar joists and beams.

D. Anti-Vibration Hangers

1.1 Anti-vibration hangers shall be combination type having a double deflection neoprene element in series with a steel coil spring; double deflection of 0.30"; steel coil spring shall be selected from a 1" static deflection series with a minimum additional travel to solid of ½"; spring diameters shall be large enough to permit 15 degree angular misalignment of the rod connecting the hanger to the ceiling support without rubbing the hanger box.

2.3 Light Fixture Hangers

A. Refer to Section 16500

Corrosive Areas: PVC; at factory apply a minimum of 10-mil-thick PVC coating, bonded to metal, inside and outside.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hangers

1 Approved hangers and stiff leg supports shall be installed in quantity and size as required to carry the weight of raceway and contents and shall be arranged to prevent vibration transmission to the building and allow for raceway movement.

2 Hangers shall be supported by means of uncoated solid steel rods which are threaded to allow vertical adjustments. Lock nuts shall be provided in sufficient number and location to lock all rod adjustments permanently at the adjusted height. Two lock nuts shall be used unless the nut tightens against a threaded socket. Minimum rod diameters shall be as follows:

NOMINAL CONDUIT SIZE	ROD DIAMETER
1/2" through 2"	1/4"
2-1/2" through 3"	3/8"
4" and 5"	1/2"

3 Hanger spacing shall be as required for proper and adequate support raceway, but in no case shall be less than one hanger per 8'-0" of raceway length except that conduit less than 1" diameter shall be supported at least every 6'-0".

4 Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.

5 Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

B. Supports

1 Support of hangers shall be by means of sufficient quantities of individual after set steel

expansion shields, or beam clamps attached to structural steel.

2 Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.

3 Ceiling mounted lighting fixtures shall be supported from the building structure at two opposite corners. The Contractor shall provide fixture hangers to properly interface with the ceiling system.

4 Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.

5 Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.

6 Support of hangers from concrete tees shall be by means of sufficient quantity of angle iron brackets attached with after set expansion shields and bolts.

END OF SECTION

SECTION 16440 - DISCONNECT SWITCHES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of disconnect switches, including all related systems and accessories.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

B. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.

C. Provide designations for each disconnect. RE: to section 16075.

1.4 REFERENCE STANDARDS

A. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - Enclosed and Dead Front Switches
2. NEMA KS1 - Enclosed Switches
3. NEMA 250 - Enclosures for Electrical Equipment

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Cutler – Hammer Products

B. Square D Co.

C. G.E

2.2 GENERAL

A. Switches shall be heavy duty type.

2.3 SWITCH INTERIOR

A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open.

D. Lugs shall be copper and front removable and UL listed for 60°C or 75°C conductors 30-100 ampere, 75°C conductors 200 ampere and up.

E. Current carrying parts shall be plated to resist corrosion.

F. Switches shall have removable arc suppressor to facilitate easy access to line side lugs.

G. Switches shall have provisions for a field installable electrical interlock.

2.4 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

B. The operating handle shall be an integral part of the box, not the cover.

C. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

D. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and indicate handle position.

E. Switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.5 SWITCH ENCLOSURES

A. Switch covers shall be attached with welded pin-type hinges (Type 1) or top-hinged, attached with removable screws and securable in the open position (Type 3R).

B. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1) or gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

C. The enclosure shall have ON and OFF markings stamped into the cover.

D. The operating handle shall be provided with a dual colored, red/black position indication.
E. Switches shall have provisions to accept up to three 3/8" hasp padlocks to lock the operating handle in the OFF position.
H. Tangential knockouts shall be provided to facilitate ease of conduit entry (Type 1).
I. Type 3R enclosure shall contain no knockouts. Supply watertight hubs.
J. Type 4x shall be stainless steel enclosure with no knockouts. Supply watertight hubs.

2.6 SWITCH RATINGS

A. Switches shall be horsepower rated.
B. The UL listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere employing appropriate fuse rejection schemes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated shown or not shown.
B. Install fuses in fusible disconnect switches.

END OF SECTION

SECTION 16442 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panelboards.
   2. Distribution panelboards.

B. Related Sections include the following:
   1. Division 16 Section "Fuses."

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. RFI: Radio-frequency interference.
D. RMS: Root mean square.
E. SPDT: Single pole, double throw.
F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. UL listing for series rating of installed devices.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports and include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Keys: [SIX] 6 spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
   a. Eaton Corp.; Cutler-Hammer Products.
   b. Square D Co.
   c. G.E

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.
   2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity.

G. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Copper and adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

J. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.

K. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

L. Split Bus: Vertical buses divided into individual vertical sections.

M. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

N. Gutter Barrier: Arrange to isolate individual panel sections.

O. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

P. Feed-through Lugs: Copper mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Plug-in or bolt on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in or Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.
3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
5. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.
B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
E. Install filler plates in unused spaces.
F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods] [Electrical Identification."
B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards 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.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 16475 – FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Fuses.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
B. Product Data for each fuse type specified.
C. Field test reports indicating and interpreting test results.
D. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source and by a single manufacturer.
B. Comply with NFPA 70 for components and installation.
C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
   1. Cooper Industries, Inc.; Bussmann Div.
   2. Eagle Electric Mfg. Co., Inc.
   3. Ferraz Corp.
   4. General Electric Co.; Wiring Devices Div.
   5. Gould Shawmut.
   6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.
   1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: Stencil legend "SPARE FUSES" in 1-1/2-inch (40-mm) letters on door.
   4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.
B. Other Branch Circuits: Class RK5, non-time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.
B. Install spare fuse cabinet where indicated.

3.4 IDENTIFICATION

A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION

SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, emergency lighting units, and accessories.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. LED lights
5. Types of lamps.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.

1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.

C. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.

D. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Interior Lighting Fixture Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

2.3 LED FIXTURES

A. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.

B. Include the following features unless otherwise indicated:

1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).

2. Each luminaire shall be rated for a minimum operational life of 50,000 hours utilizing a minimum ambient temperature of (25°C).

3. Light Emitting Diodes tested under LM-80 Standards for a minimum of 12,000 hours.
4. Color Rendering Index (CRI) of 82 at a minimum.

5. Color temperature [3500] <Insert value> K, unless otherwise indicated.
6. Rated lumen maintenance at 70% lumen output for 50,000 hours, unless otherwise indicated.

7. Fixture efficacy of 60 Lumens/Watt, minimum.

8. 5 year luminaire warranty, minimum.

9. Photometry must comply with IESNA LM-79.

10. The individual LEDs shall be constructed such that a catastrophic loss of the failure of one LED will not result in the loss of the entire luminaire.

11. Luminaire shall be constructed such that LED modules may be replaced or repaired without the replacement of the whole fixture.

C. Technical Requirements

1. Luminaire shall have a minimum efficacy of 60 lumens per watt. The luminaire shall not consume power in the off state.

2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.

3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.

4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 15 percent.

5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

D. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.

2. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.

3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

4. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.

2.4 LED EXIT SIGNS

A. Exit light fixtures shall meet applicable requirements of NFPA and UL.

B. Housing and door shall be die-cast aluminum.

C. For general purpose exit light fixtures, door frame shall be hinged, with latch. For vandal-resistant exit light fixtures, door frame shall be secured with tamper-resistant screws.

D. Finish shall be satin or fine-grain brushed aluminum.

E. There shall be no radioactive material used in the fixtures.

F. Fixtures:

1. Inscription panels shall be cast or stamped aluminum a minimum of 2.25 mm (0.090 inch) thick, stenciled with 150 mm (6 inch) high letters, baked with red color stable plastic or fiberglass. Lamps shall be luminous Light Emitting Diodes (LED) mounted in center of letters on red color stable plastic

or fiberglass.

2. Double-Faced Fixtures: Provide double-faced fixtures where required or as shown on drawings.

3. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.

G. Voltage: Multi-voltage (120 – 277V).

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 LAMPS

A. ALL LED – NO LAMPS

2.7 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Do not use grid for support.

1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:
   1. Verify normal operation of each fixture after installation.
   2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
   3. Verify normal transfer to battery source and retransfer to normal.
   4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 16521 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior lighting units with luminaries and lamps.

B. Related Sections include the following:

1. Division 16 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.

1.3 DEFINITIONS

A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.

B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.4 SUBMITTALS

A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Materials and dimensions of luminaries.

2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.

3. Certified results of laboratory tests for fixtures and lamps for photometric performance.

4. High-intensity-discharge luminaire ballasts.

B. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by acceptable to authorities having jurisdiction

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents. Warranty one labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Exterior Lighting Unit Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting

Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

2.2 LUMINAIRES

A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

B. Metal Parts: Free from burrs, sharp corners, and edges.

C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

E. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

F. Exposed Hardware Material: Stainless steel.

G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.

J. Photoelectric Relays: As follows:

1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.
2. Relay Mounting: In luminaire housing.

K. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

1. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
2. Open-circuit operation will not reduce average life.
3. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
4. Noise: Uniformly quiet operation, with a noise rating of B or better.

L. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

PART 3 - EXECUTION

3.1 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Ground metal poles/support structures according to Division 16 Section "Grounding."

1. Nonmetallic Poles: Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

3.2 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:

3.3 CLEANING AND ADJUSTING

A. Clean units after installation. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION – 16620 - STANDBY ENGINE – GENERATOR SET

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification Sections apply to Work covered by this Section.

Comply with other Division 16 Sections, as applicable. Refer to other Divisions for coordination of the Work.

1.2 SCOPE OF WORK

Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of the standby engine-generator set, including all related systems and accessories.

1.3 SUBMITTALS

A. Product Data: Include data on features, components, ratings, and performance. Include the following:
B. Dimensioned outline plan and elevation drawings of engine generator set and other components specified.
C. Thermal damage curve for generator.
D. Time-current characteristic curves for generator protective device.
E. Shop Drawings: Indicate fabrication details, dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
F. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
G. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
H. Wiring Diagrams: Detail wiring for power and control connections and differentiate between factory-installed and field-installed wiring.
I. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
J. Field Test and Observation Reports: Indicate and interpret test results and inspection records relative to compliance with performance requirements.
L. Certified summary of prototype-unit test report.
M. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
O. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.
P. Factory Test Reports: For units to be shipped for this Project, showing evidence of compliance with specified requirements.
R. Exhaust Emissions Test Report: To show compliance with applicable regulations.
S. Sound or noise measurement test report.
T. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.
U. Field test report of tests specified in Part 3.
V. Maintenance Data: For each packaged engine generator and accessories to include in maintenance manuals specified in Division 1. Include the following:
X. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
Y. Detail operating instructions for both normal and abnormal conditions.
Manufacturer’s installation instructions.
1.4 WARRANTY

A no deductible warranty shall be provided for all products against defects in materials and workmanship for a two year or 1500 hour period from the start-up date, per the manufacturer's Extended Coverage Limited Warranty.

PART 2 - PRODUCTS

MANUFACTURER

1. Cummins
2. Caterpillar
3. Generac

2.1 GENERAL

The installation of a Standby Electric Power System shall include one electric generating set rated as shown on the plans.

The system shall be packaged by manufacturer

1. A diesel engine driven electric generating set to provide standby power.
2. An engine start-stop control system mounted on the generating set.
3. An automatic load transfer control to provide automatic starting and stopping of the engine and switching of the load.
4. Mounted accessories as specified.

This system shall be built, tested and shipped by same Manufacturer so there is one source of supply and responsibility. The performance of this generating set series shall be tested at full power rating, stability and voltage and frequency regulation.

This standby electric power system, furnished completely by the manufacturer, shall be warranted for a period of one year from the date of start-up.

B. Engine

The Engine shall be diesel-fueled, turbo charged, four-cycle, water cooled with mounted radiator, fan and water pump. It shall be sized to deliver the required KW rating. Intake and exhaust valves shall be heat resisting alloy steel, free rotating. Exhaust valve seat inserts shall be provided. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have air cleaner, coolant, fuel and oil filters with replaceable elements; lube oil cooler and a fuel transfer pump. Engine speed shall be governed by a Woodward Electronic governor to maintain alternator frequency within .25 percent from no-load to full-load alternator output. The engine shall have a 12-volt battery charging DC, alternator with a transistorized voltage regulator. Starting shall be a 12-volt, solenoid shaft, electric starter.

C. Engine Instruments

The engine instrument panel shall contain an oil pressure gauge, coolant temperature gauge and battery charge rate voltmeter.

a. Engine Controls

The generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cranking limiter shall be provided to open the starting circuit after three cycle cranking attempts. The engine controls shall also include a 3-positon selector switch with the following positions: RUN-STOP-REMOTE. High engine temperature, low oil pressure, and overspeed shutdown with signal light and alarm terminal shall also be provided.

b. Brushless Alternator

The alternator shall be a 4-pole, revolving field design with temperature compensated solid state voltage regulator and brushless rotating rectifier exciter system. No brushes shall be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexable driving flange to insure permanent alignment. The insulation system shall be Class H as defined by NEMA MG1-165. The three phase, broad range alternator shall be 12-lead, reconnectable. Excitation system shall be capable of sustained short circuit current of 3 X FLC at 60 Hz.

c. Unit Performance

Frequency regulation shall not exceed .25-hertz from no load to rated load. Voltage regulation shall be within plus or minus 1 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 15 percent of rated voltage when full, 3-phase, load and rated power factor is applied to the alternator. Recover to stable operation shall occur within 2 seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise shall be within NEMA MG1-22.40 definition.

d. Alternator Instrument Panel

The alternator instrument panel shall be wired, tested and shock mounted on the generating set by the Manufacturer of the Genset. It shall contain panel; frequency meter; running time meter; voltage potentiometer, AC voltmeter; AC ammeter; meter switch; voltmeter-ammeter phase selector with OFF position. Panel shall provide annunciation of: low oil pressure, low water temp., high water temp., overspeed, over crank, low battery, high battery, low fuel level, fuel tank leak detection, control panel not in auto position. Supply 16 light remote annunciation.

e. Generating Set Mounting

The electric generating set shall be equipped with vibration isolators between genset & genset base which shall provide suitable mounting to any level surface.

f. Housing

The complete generating set shall be enclosed in a weatherproof highly corrosion resistant galvanized sheet metal housing with removable side panels and hinged meter panel door. Enclosure shall incorporate internally mounted residential grade muffler.

g. Accessories

All accessories needed for the proper operation of the generating set shall be furnished. These shall include a residential muffler internally mounted inside weatherproof enclosure, flexible exhaust connection, starting batteries, battery cables, battery rack, 5amp battery charger , 110 volt 1500 watt jacket water heater, 120 volt thermostat controlled alternator heater, double wall UL-142 Listed base mounted fuel tank for 24-hours, with flexible fuel lines, Unit mounted UL - Listed circuit breaker rated at maximum genset output and detailed operation and maintenance manuals.

h. Automatic Load Transfer Control

1. Refer to Electrical riser diagram rated automatic transfer switch model number and specification. Upon power line return, transfer the load back to the line and stop the standby set

i. Startup & Delivery

Genset shall be delivered to job site. (off loading by installing contractor) Startup up shall be performed by factory trained person using available site loads.

2.3 ENGINE-GENERATOR SET BASE

The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

2.4 AUXILIARY EQUIPMENT AND ACCESSORIES

Engine mounted, thermostatically controlled, water jacket heater. The heater shall be sized as recommended by the generator set manufacturer. Vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location. Starting and Control Batteries: Starting battery bank, calcium/lead antimony type, 24 volt DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors. Battery Charger: A UL listed/CSA certified 10 amp voltage regulated battery charger shall be provided for each engine-generator set. The charger may be located in an automatic transfer switch, or may be wall mounted, at the discretion of the installer. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of

Loss of AC power - red light

Low battery voltage - red light
High battery voltage - red light
Power ON - green light (no relay contact)
Analog DC voltmeter and ammeter, 12 hour equalize charge timer, AC and DC fuses shall also be provided on the charger.

2.5 REMOTE ANNUNCIATOR

Provide and install a 20-light LED FLUSH remote alarm annunciator with horn, toc be located by owner. The remote annunciator shall provide the following audible and visual alarms:

Lamp Legend	Generator Set Condition Indicated			Light	Alarm
High Battery Voltage	Battery charger too high	Red	No		
Low Battery Voltage	Battery voltage too low	Red	No		
Normal Battery Voltage	Battery voltage ok			Green	No
Generator Running	Generator has output voltage	Green	No		
Normal Utility Power	Utility power supplying the load		Green	No	
EPS Supplying Load	Genset supplying the load	Green	No		
Pre-Low Oil Pressure	Oil pressure approaching low limit		Yellow	Yes	
Low Oil Pressure	Engine has shut down due to low oil pressure		Red	Yes	
Pre-High Coolant Temp	Temperature of coolant approaching high limit		Yellow	Yes	
High Coolant Temp	Genset has shut down due to high coolant temp	Red	Yes		
Low Engine Temp	Engine heater has malfunctioned	Red	Yes		
Overspeed	Engine has shut down due to overspeed	Red	Yes		
Overcrank	Engine failed to start			Red	Yes
Not in Auto	Engine control switch not in AUTO position	Flashing	Red	Yes	
Battery Charger Malfunction	Charger is signaling a failure		Red	Yes	
Low Fuel	Fuel level below preset minimum		Red	Yes	
Fuel Leak	Fuel leak detected within dual wall containment of fuel tank		Red	Yes	

Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator.

Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (where switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared. The remote annunciator shall comply with NFPA 110 for Level 1 emergency power supply systems. The remote annunciator shall be located in the main administration office. Provide (1)- 3"C underground to the mentioned location. Coordinate exact location. Provide all accessories as required for an operational system.

2.6 EXHAUST MUFFLER

Exhaust muffler(s) shall be provided for the engine, size and type as recommended by the generator set manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the generator set manufacturers recommendations and applicable codes and standards.

2.7 FUEL SYSTEM

Sub-Base Fuel Storage Tank: Provide a skid mounted fuel storage tank with minimum 24 hours operation at full load. The tank shall be constructed of corrosion resistant steel and shall be UL listed double wall. The equipment, as installed, shall meet all local and regional requirements. Fuel leak detection shall be provided within the containment. Contractor shall include the ¾ full tank with fuel in the bid.

PART 3 - EXECUTION

3.1 INSTALLATION

The standby engine-generator set shall be installed as recommended by the manufacturer(s) and as required by the local authorities having jurisdiction.

The Contractor shall coordinate the installation of the standby engine-generator and the automatic transfer switch to insure a completely functional and operational system.

3.2 FACTORY TESTING

The manufacturer's standard factory test shall be provided. A certified test report shall be provided upon delivery.

3.3 START UP AND ON-SITE TESTING

The manufacturer's authorized representative/technician shall provide startup and on-site testing.

On-Site Testing

Perform on-site testing in the presence of the Owner's Representative.

Prestart Checks

Oil level
Water level
Day tank fuel level
Main tank fuel level
Battery connection and charge condition
Engine to control interconnects
Engine generator intake/exhaust obstructions
Enclosure ventilation obstructions
Removal of all packing materials

Operation

Load: 30-minutes operation at 50% of full load rating. 30-minutes operation at 75% of full load rating. Four (4) hours operation at 100% of full load rating. After the first half-hour stabilization period at full load, the following shall be recorded at fifteen minute intervals:
Voltage and amperage (3 phase), frequency
Fuel pressure, oil pressure and water temperature
Proper operation of controls, engine shutdown, and safety devices shall be demonstrated.
The manufacturer's representative shall provide resistive load banks and fuel for all testing, including fuel for retests due to test failures. Building load shall not be used.
Should these tests indicate that the equipment does not meet the specified performance requirements, National Electric Code and Local codes, the cost of all corrective measures shall be borne by the manufacturer's and/or local authorized dealer.

Orientation

The manufacturer's local authorized dealer shall provide a complete orientation for the Owner's engineering and maintenance personnel. Orientation shall include both classroom and hands-on instruction. Topics covered shall include control operation, schematics, wiring diagrams, meters, indicators, warning lights, shutdown system and routine maintenance.

Service Manuals and Parts Books

The manufacturer's local authorized dealer shall furnish one copy of each of the following manuals and books listed:
Operating Instructions: With description and illustration of all engine and generator controls and indicators.
Parts Books: That illustrate and list all assemblies, subassemblies and components, except standard fastening hardware (nuts, bolts, washers, etc.).
Preventative Maintenance Instructions: On the complete unit that cover daily, weekly, monthly, biannual , and annual maintenance requirements and include a complete lubrication chart.
Routine Test Procedures: For all electronic and electrical circuits and for the main AC generator.
Troubleshooting Chart: Covering the complete unit showing description of trouble, probable cause, and suggested remedy.
Recommended Spare Parts List: Showing all consumables anticipated to be required during routine maintenance and test.
Wiring Diagrams and Schematics: Showing function of all electrical components.
All manuals and books described above shall be contained in rigid plastic pouches.

Contract Maintenance

The system manufacturer's local authorized dealer shall furnish the Owner with a copy of any contract maintenance agreement negotiated relative to the equipment specified in this section. The contract information shall detail agreed maintenance intervals, work to be performed at each interval, reimbursement schedule for maintenance work, and owner's responsibilities versus dealer's responsibilities

END OF SECTION

SECTION 16693 - BRANCH CIRCUIT PANELBOARD POWER CONDITIONING SURGE PROTECTION DEVICE

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions, apply to work covered by this Section.

B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

1.2 SCOPE OF WORK

A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a high-energy power conditioning surge protection device(s) at branch circuit panelboards where indicated on the Drawings. The device shall incorporate transient voltage surge suppression (TVSS) and high-frequency electrical line noise filtering. The device shall provide effective high energy transient voltage suppression, surge current diversion, high-frequency attenuation, and line stabilization in ANSI/IEEE C62.41-2002 environments connected downstream from the facility's main overcurrent protective device. The device shall be connected in parallel with the facility's wiring system.

B. The device shall be installed as an integral part or external of the panelboard, switchboard.

1.3 SUBMITTALS

A. Submit product data and shop drawings for products specified under PART 2 - PRODUCTS.

B. Manufacturers' Product Data: Submit material specifications and installation data for products specified under PART 2 - PRODUCTS.

C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract documents.

1 Include electrical characteristics and ratings for the specified equipment.

2 Include wiring diagrams indicating the internal connections of the specified equipment within its enclosure.

3 Drawings shall be provided indicating device dimensions, weights, mounting provisions, connection details and wiring diagrams.

4 Documentation of the specified device UL 1449 3rd Edition voltage protection rating (VPR) and per mode surge current rating shall be included. All submittals without this documentation will be rejected.

5 The manufacturer shall make available upon request certified documentation of applicable Location Category Testing in full compliance with ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1987 Guidelines.

D. Record Drawings

1 A complete set of manufacturers' product data and shop drawings indicating all post bid revisions and field changes.

1.4 QUALITY ASSURANCE

A. Industry Reference Standards and Publications: The device shall be designed, manufactured, tested and installed in compliance with the latest editions of:

1 American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41-2002 and C62.45-2002)

2 Federal Information Processing Standards Publication 94 (FIPS PUB 94)

3 National Electrical Manufacturers Association (NEMA LS-1)

4 National Fire Protection Association (NFPA 70, National Electrical Code (NEC), 75 and 78)

5 Underwriters Laboratories UL 1449 Standard for Transient Voltage Surge Suppressors Surge Protection Devices and UL 1283 Standard for Electromagnetic Interference Filters.

B. The device shall be UL listed under UL 1449 and UL 1283 complimentary listed.

C. The device shall be warranted against defects in material and/or workmanship and any failure or end-of-life event including lighting for a minimum of TEN (10) years from the date of shipment.

D. The device shall be thoroughly factory-tested before shipment. Testing of the device shall include but not be limited to quality control checks, maximum continuous operating voltage (MCOV) check, and clamping voltage verification tests. The MCOV check shall consist of a minimum of one (1) hour burn-in at the applicable

MCOV.

1.5 SYSTEM DESCRIPTION

A. Environmental Requirements

1 Storage Temperature: Storage temperature range shall be -40º to +85º C (-40º to +185º F).

2 Operating Temperature: Operating temperature range shall be -40º to +60º C (-40º to 140º F).

3 Relative Humidity: Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.

4 Operating Altitude: The device shall be capable of operation in an altitude of 0 - 12,000 feet above sea level.

5 Audible Noise: The device shall not generate any audible noise.

6 Magnetic Fields: No appreciable magnetic fields shall be generated. The device shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

B. Electrical Requirements

1 Device Operating Voltage: The nominal operating voltage and configuration shall be that of the switchgear, distribution panel, sub or branch panelboard. Maximum Continuous Operating Voltage (MCOV): The allowable maximum continuous operating voltage of all suppression components utilized in the unit shall not be less than 115% of the nominal operating voltage.

2 Operating Frequency: The operating frequency range of the device shall be 47 to 63 Hertz.

3 Protection Modes: The devices primary mode of protection shall be line-to-neutral. The secondary modes of protection shall be line-to-ground and neutral-to-ground.

4 Surge Current Capacity and Voltage Protection Rating: Unless specifically noted on the drawings and/or the schedules, the surge current capacity, and the voltage protection rating of the SPD shall be not less than listed on the following table.
The above text gives you the option to request a specific surge current rating on the riser or panel schedules

Location	Per Mode Surge Current Rating	120/208vac 3 phase VPR	277/480vac 3 phase VPR
Switchgear	200,000 amps	900v	1200v
Distribution Panel	150,000 amps	900v	1200v
Sub or Branch Panel	100,000 amps	900v	1200v

5. Construction: SPD's with a surge current rating of greater than 155,000 amps per mode shall be field serviceable modular devices. SPD's with a surge current rating of less than 155,000 amps may be non-modular.

1.6 DOCUMENTATION

A. Equipment Manual. The manufacturer shall furnish an equipment manual with installation, operation, and maintenance instructions for the system.

PART 2 - PRODUCTS

2.1 MANUFACTURER

1 Square D
2 Cutler-Hammer
3 Current Technology
4 THOR SYSTEMS

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSION COMPONENTS

A. The device shall include a solid-state suppression system which includes arrays of fused non-linear voltage dependent metal oxide varistors (MOV's) with similar operating characteristics. The suppression system shall not utilize gas tubes, spark gaps, silicon avalance diodes or other components which might short or crowbar the line, thus leading to interruption of normal power flow to or system upset of connected loads. The suppression system shall not incorporate any other components which may degrade performance or reliability of the

2.3 HIGH-FREQUENCY FILTER

A. The device shall include a UL 1283 high frequency extended range tracking filter. The filter shall reduce fast rise-time, high-frequency, error-producing transients and electrical line noise eliminating disturbances which

may lead to system upset. The filter shall provide minimum insertion loss of 45 dB at 100 kHz attenuation frequency utilizing the MIL-STD-E220A 50 ohm insertion loss methodology.

2.4 INTERNAL CONNECTIONS

A. All internal wiring associated with the suppression/filter device and subject to surge currents shall utilize low-impedance copper bus bar and/or #4 AWG copper conductor or larger. All internal connections associated with the suppression/filter device and subject to surge currents shall be made with compression solderless-type lugs and shall be bolted to the bus bars in order to reduce overall system impedance.

2.5 FIELD CONNECTIONS

A. The device shall include mechanical lugs for each phase, neutral and ground, or permanently connected conductors as applicable. The lugs shall accommodate up to #4 AWG copper conductor.

2.6 ENCLOSURE

A. The device shall be provided in a surface mounted NEMA 1 type hinged enclosure, with a NEMA rating that matches or exceeds that of the switchgear, distribution panel, sub or branch panelboard that is being protected. of minimum 14 gauge steel, painted inside and out. Enclosure width shall not be greater than 24 inches.

2.7 MONITORING

A. The device shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status of each phase of the unit.

B. Dry Contacts

C. Audible alarm with silence switch

D. For Service Entrance or Switchgear SPD's: LED visual status indicators, Audible alarm with silence switch, Dry Contacts plus Surge Event Counter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The installation and testing of the system shall be in full accordance with the manufacturer's installation, operation and maintenance instructions, and all national and local codes.

B. The device shall be installed as close as practical to the facility's wiring system in accordance with NEC Article 285, IEEE 1100-2005 section 8.4.2.5, plus applicable national/local electrical codes and the manufacturer's recommended installation instructions. Connection shall be from a minimum 40A branch circuit breaker in the switchgear, distribution panel or panelboard with #4 AWG copper conductors not any longer than necessary, avoiding unnecessary bends. Advise the engineer if the installed In no case shall conductors will be longer than 3 feet in length. Verify circuit breaker size with manufacturer.

3.2 TESTING

A. The system shall be field tested in the presence of the Owner. At the same time operational procedures shall be reviewed with the Owner.

B. If external test equipment is required, two (2) testers shall be furnished to the owner and two (2) training sessions shall be furnished. The first training session shall be with 90 days of occupancy and the second training session shall be not less eight months, but not more than 12 months after the first training session. Training and test equipment shall be furnished at no additional cost to the owner.

END OF SECTION

SECTION 16721 - FIRE ALARM/LIFE SAFETY SYSTEM

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification Sections apply to Work covered by this Section.

B. Comply with other Division 16 Sections, as applicable. Refer to other Divisions for coordination of the Work.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing additional devices for the building fire alarm system, including all related systems and accessories.

1. Fire alarm control panel
2. Remote Annunciator
3. Addressable or conventional manual fire alarm stations.
4. Addressable analog and conventional area smoke detectors.
5. Conventional beam detectors.
6. Addressable analog and conventional duct smoke detectors.
7. Addressable analog and conventional heat detectors.
8. Sprinkler water flow alarm switches.
9. Audible notification appliances; bells, horns, chimes.
10. Visual notification appliances; strobes.
11. Central station alarm connection control.
12. Air handling systems shutdown control.
13. Stair pressurization system startup control.
14. Magnetic door holder release.
15. Dry pipe sprinkler release valve/deluge valve control.
16. Sprinkler supervisory switches and tamper switch supervision.
17. Dry pipe sprinkler release valve/deluge valve supervision.
18. Emergency generator supervision.
19. Fire pump supervision.
20. Battery standby.
21. System shall activate the overhead gates. Provide all accessories for an active system.

1.3 SUBMITTALS

A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

B. The submittal data shall include, but not necessarily be limited to, the following:

1 Complete bill of material indicating quantity, part numbers and brief description.
2 Data sheets for all products. If multiple models are shown on the same data sheet, highlight the specific model used.
3 Provide drawing with all devices.
4 Provide single line riser diagram showing all equipment and type, number and size of all conductors.

1.4 REFERENCE STANDARDS

A. The fire alarm system devices specified herein shall be designed, manufactured, installed and tested according to the latest version of the following standards:

1 National Fire Protection Association Standards
1 NFPA 70 - National Electric Code (NEC), Articles 725 & 760.
2 NFPA 71 - Central Station Signaling Systems
3 NFPA 72 - National Fire Alarm Code (NFAC)
4 NFPA 92A - Smoke Control Systems
5 NFPA 101 - Life Safety Code
2 Underwriters Laboratories, Inc.
1 UL 38 - Manually Activated Signaling Boxes
2 UL 228 - Door Holders for Fire Protective Signaling Systems
3 UL 268 - Smoke Detectors for Fire Protective Signaling Systems
4 UL268A - Smoke Detectors for Duct Applications

5 UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
6 UL 464 - Audible Signaling Appliances
7 UL 864/UOJZ/APOU - Control Units for Fire Protective Signaling Systems
8 UL 1481 - Power Supplies for Fire Protective Signaling Systems
9 UL 1638 - Visual Signaling Appliances
10 UL 1711 - Amplifiers for Fire Protective Signaling Systems
11 UL 1971 - Standard for Fire Protective Signaling Systems
3 Americans with Disabilities Act (ADA)
4 Local and State Building Codes
5 Local Authorities Having Jurisdiction (LAHJ)

1.5 QUALITY ASSURANCE

A. The fire alarm system devices shall be listed and labeled by Underwriters Laboratories, Inc. for use in fire protective signaling system.

B. The Installing Contractor shall be factory authorized and trained and shall be NICET certified in the sub-field of Fire Alarm Systems, for the engineering and technical installation and supervision of the system. This certification shall be Level III for engineering and Level II for technical installation and supervision. Proof of certification shall be provided. All work shall be performed by skilled technicians, under the supervision and direction of the designated NICET engineering technician, all of whom shall be properly trained and qualified for the work.

C. The fire alarm contractor shall not sub out portion of the work. The fire alarm shall be responsible to complete the job.

1.6 QUALIFICATIONS

1. The fire alarm contractor, as a business entity, shall be an authorized and designated representative of the equipment manufacturer and shall have been actively engaged in the business of selling, installation and servicing fire alarm systems for a period of at least (5) years prior to the bid date.

2. The fire alarm contractor shall have an office within Rio Grande Valley area of the job site staffed with trained technicians who are qualified to manage the installation, to be responsible that the system is installed as submitted, to conduct system start-up, to instruct the project coordinators representatives and local authorities in the proper operation of the system, and to provide service throughout the warranty period. 3. The fire alarm contractor SHALL NOT HAVE any grievances or complaints on record regarding workmanship, code compliance, or service response with either the project coordinator, Architect, Engineer, Owner or the State Fire Marshals office. A contractor that has any prior finding(s) of a Fire Alarm license violation or has any litigation in process with the State Fire Marshal is unacceptable.

3. The fire alarm contractor shall be an active installer on the approved manufacturer for a minimum of 5 years.

1.7 WARRANTY

Warranty of all control equipment, sensors, I/O modules and all other peripherals and of materials, installation and workmanship shall be for one (1) year from date of acceptance.

2.The Contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Silent Knight

2.2 CIRCUITING GUIDELINES

A. Each addressable analog loop shall be circuited as shown on the drawings but device loading in not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class A B operation. When it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class A B zone wiring. The audio system components shall be an integral part of the fire alarm system control panel.

B. Audio Amplifiers

1 Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any digitized audio channels. The channel selection shall be directed by the system software. Multiple and different audio signals shall be able to be broadcast simultaneously from the same system network node.

2 Each amplifier output shall include a dedicated, supervised speaker circuit which is suitable for

connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit for connection of visual (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.

3 Standby audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.

4 In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.

5 In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone.

6 Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

2.3 DETECTORS

A. General

1 Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters.

2 Detectors shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total loop response time for detectors shall be 0.5 seconds.

3 Detectors shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.

4 Detectors shall be capable of identifying diagnostic codes to be used for system maintenance. The diagnostic codes shall be stored at the detector.

5 Detectors shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each detector shall be individually programmable to operate at various sensibility settings.

6 The detector microprocessor shall contain an environmental compensation algorithm which identifies and sets ambient "environmental thresholds." The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminates as well as detector aging. The process shall employ digital compensation to adapt the detector to both long term and short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be permanently stored at the detector.

7 The detector and loop controller shall provide increased reliability and inherent survivability through intelligent conventional operation. The device shall automatically change to stand alone, conventional device operation in the event of a loop controller polling communications failure. In the standalone detector mode, the detector shall continue to operate using sensitivity and environmental compensation information, stored in its microprocessor at the time of communications failure. The loop controller shall monitor the loop and activate a loop alarm if a detector reaches its alarm sensitivity threshold.

8 Detectors shall be capable of automatic electronic addressing and/or custom addressing. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.

9 Detectors shall be suitable for operation in the following environment:

1 Temperature: 32ºF to 120ºF
2 Humidity: 0-93% RH, non-condensing
3 Elevation: Up to 6,000 ft.

B. Photoelectric Smoke Detectors

1 Addressable intelligent photoelectric smoke detectors shall be provided as indicated on the Drawings. The detector shall use a light scattering type photo electric smoke sensor to sense changes in air samples from its surroundings. An integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The detector shall utilize digital filters to remove signal patterns that are not typical of fires. Each detector shall have twin red/green status LEDs. The red LED shall indicate alarm condition and green LED shall indicate normal.

2 The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature and humidity. The information shall be stored in the integral processor and transferred to the loop controller.

3 Detector shall be programmable for different sensitivity during day and night periods.

4 The detector shall be suitable for direct insertion into air ducts up to 3 ft. high and 3 ft. wide with air velocities up to 5,000 ft/min.

5 The detector shall be rated for ceiling installation at a minimum of 30 foot centers.

6 The percent smoke obscuration per foot alarm setpoint for the detector shall be field selectable to various sensitive settings ranging from 1.0% to 3.5%.

C. Detector Mounting Bases

1 Detector mounting bases shall be suitable for mounting on a standard 4" square electrical outlet box. The base shall contain no electronics, support all detector types and have the following minimum requirements:

1 Removal of the respective detector shall not affect communications with other detectors.
2 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
3 Capable of supporting a remote LED indicator and test station. Provide remote LED indicators and test stations as indicated on the Drawings.

D. Detector Mounting Plates

1 Provide detector mounting plate assemblies to facilitate mounting detectors for direct insertion into low velocity ductwork. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish.

E. Duct Smoke Detectors

1 Air duct mounted smoke detectors shall be provided in the air supply stream of all central air handling equipment above 2000 cfm, i.e. Provide all necessary interface wiring for proper system operation.

2 The duct smoke detector shall be UL listed per UL 268A specifically for use in air handling systems. The detector shall operate at velocities of 300-4000 ft./min. The detector housing shall be equipped with an integral mounting base. It shall be capable of local testing via magnetic switch or remote testing using a remote test station. The duct detector housing shall incorporate an airtight smoke chamber in compliance with UL 268A. The housing shall be capable of mounting to either

rectangular or round ducts without adaptor brackets. An integral filter system shall be included to reduce dust and residue effects on detector housing, thereby reducing maintenance and servicing. Sampling tubes shall be easily installed after the housing is mounted to the duct by passing through the duct housing. The housing shall have a red enamel finish.

3 For each duct smoke detector provide a remote LED indicator and test station to be mounted in a location indicated on the Drawings and approved by the local authority having jurisdiction.

F. Beam Type Smoke Detectors 1. Provide projected beam type smoke detectors. Then beam detectors shall be four wire 24 Vdc and powered from the control panel 4 wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 ft. (9.14 to 30.4m) or a long range of 100 to 300 ft. (30.4 to 91.4m). The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or mount as shown on the plans. Testing shall be carried out using calibrated test filters. Provide an activated remote test station>.

2.4 SYSTEM MODULES

A. Addressable intelligent modules shall support supervised Class B circuits. The modules shall be multi-function capable of field programming. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

1 Temperature: 32ºF to 120ºF (0ºC to 49ºC)

2 Humidity: 0-93% RH, non-condensing

B. Single Input Module

1 Addressable intelligent single input modules shall be provided as required for the system configuration. The single input module shall provide one (1) supervised Class B input circuit. The module shall be suitable for mounting on 4” square electrical box. The single input module shall support the following input circuit types:

1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

2 Normally-Open Alarm Delayed Latching (Waterflow Switches)

3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

4 Normally-Open Active Latching (Supervisory, Tamper Switches)

C. Dual Input Module

1 Addressable intelligent dual input modules shall be provided as required for the system configuration. The dual input module shall provide two (2) supervised Class B input circuits. The module shall be suitable for mounting on a standard 4” square electrical box. The dual input module shall support the following input circuit types:

1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)

2 Normally-Open Alarm Delayed Latching (Waterflow Switches)

3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)

4 Normally-Open Active Latching (Supervisory, Tamper Switches)

D. Monitor Module

1 Addressable intelligent monitor modules shall be provided as required for the system configuration. The monitor module shall support one (1) supervised Class B normally-open active non-latching monitor circuit. The monitor module shall be suitable for mounting on a standard 4” square electrical box.

E. Waterflow/Tamper Module

1 Addressable intelligent waterflow/tamper modules shall be provided as required for the system configuration. The waterflow/tamper module shall support two (2) supervised Class B input circuits. Channel A shall support a normally-open alarm delayed latching waterflow switch circuit. Channel B shall support a normally-open active latching tamper switch. The waterflow/tamper module shall be suitable for mounting on a standard 4” square electrical box.

F. Single Input Signal Module

1 Addressable intelligent single input signal modules shall be provided as required for the system configuration. The single input signal module shall provide one (1) supervised Class B output circuit capable of supporting the operation of an audible/ visual signal power selector and a telephone power selector with ring tone for fire fighter's telephone. The module shall be suitable for mounting on a standard 4" square electrical box.

G. Dual Input Signal Module

1 Addressable intelligent dual input signal modules shall be provided as required for the system configuration. The dual input signal module shall provide a means to selectively connect one of two (2) signaling circuits to one (1) supervised output circuit. The dual input signal modules shall be capable of supporting the operation of an audible/visual signal power selector. The module shall be suitable for mounting on a standard 4" square electrical box.

H. Control Relay Module

1 Addressable intelligent control relay modules shall be provided as required for the system configuration. The control relay module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on a standard 4" square electrical box.

I. Universal Class A/B Module

1 Addressable intelligent class A/B modules shall be provided as required for the system configuration. The universal class A/B module shall be capable of numerous operations. The module shall be suitable for mounting on a standard 4" square electrical box. The universal class A/B module shall support the following circuit types:

1 Two (2) supervised Class B Normally-Open Alarm Latching.
2 Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
3 Two (2) supervised Class B Normally-Open Active Non-Latching.
4 Two (2) supervised Class B Normally-Open Active Latching.
5 One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
6 One (1) supervised Class A Normally-Open Alarm Latching.
7 One (1) supervised Class A Normally-Open Alarm Delayed Latching.
8 One (1) supervised Class A Normally-Open Active Non-Latching.
9 One (1) supervised Class A Normally-Open Active Latching.
10 One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
11 One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.
12 One (1) supervised Class A 2-wire Smoke Alarm Verified
13 One (1) supervised Class B 2-wire Smoke Alarm Verified
14 One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
15 One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.

2.5 MANUAL PULL STATIONS

A. Addressable intelligent dual action, non-break glass type, key reset, semi-flush mounted manual pull stations shall be provided as indicated on the Drawings. The stations shall be of Lexan construction, finished in red with white molded raised letters "PULL IN CASE OF FIRE". The station shall be suitable for mounting on a standard 4" square electrical box. The station shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

1 Temperature: 32°F to 120°F (0°C to 49°C)
2 Humidity: 0-93% RH, non-condensing

2.6 NOTIFICATION APPLIANCES

A. General

1 All appliances shall be UL listed for Fire Protective Service. All audible appliances, visual appliances and combination audible/visual appliances shall be capable of providing the equivalent

facilitation which is allowed under the Americans with Disabilities Act Accesabilities Guidelines (ADA/AG), and shall be UL 1971, and ULC S526 listed.

B. Audible Only Notification Appliances
1 Audible appliances shall be a mylar cone type speaker. Paper type cones are not acceptable. The rear of the speaker shall be completely sealed protecting the cone during and after installation. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide UL confirmed 90 dBA sound output at 2w.
2 Audible appliances shall be provided with in/out wiring terminals.
3 Audible appliances shall be flush for ceiling mounted and flush/semi-flush for wall mounted as indicated on the Drawings. They shall have a white faceplate for ceiling mounting and red faceplate for wall mounting. They shall mount to a standard 4" square electrical box.

C. Visual Only Notification Appliances
1 Visual appliances shall be a self-synchronized strobe. The strobe flashtube shall be enclosed in a rugged lexan lens with solid state circuitry. The strobe shall provide 15, 15/75, 30, 60 and 110 candela synchronized flash outputs. The strobe intensity selection shall be based on the installed location within the building.
2 Visual appliances shall be provided with in/out field wiring terminals.
3 Visual appliances shall have lens markings oriented for wall mounting where indicated on the Drawings. They shall have a red faceplate for flush/semi-flush wall mounting. They shall mount to a standard 4" square electrical outlet box.

D. Combination Audible/Visual Notification Appliances
1 Combination appliances shall be a combination of the audible and visual appliances specified previously. They shall have a red faceplate for flush/semi-flush wall mounting.
2 The majority, if not all, of the notification appliances shall be combination devices such that the visual and audible requirements of ADA shall be complied with. Visual notification appliances shall be located in all areas of common use, i.e. lobbies, hallways, restrooms, meeting/conference/assembly areas, break rooms, copy/fax/mail rooms, etc. Audible notification appliances shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15dbA or exceeds any maximum sound level with a duration of 60 seconds by 5dbA, whichever is louder. Sound levels for alarm signals shall not exceed 120 dbA. It is the intent of the Drawings to show all devices that are required. The fire alarm system vendor/bidder shall provide all appliances shown and/or required by these specifications but it others are anticipated to be required the vendor/bidder shall qualify the provisions for the system making note of the additional cost for the anticipated additional requirements.

2.7 ANCILLARY DEVICES

A. Remote Relays
1 Multi-Voltage Control Relays
1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT or DPDT, as required, and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, 24 Vac, 115 Vac, or 230 Vac, as required. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
2 Manual Override Control Relays
1 Remote control relays with a manual override shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.
3 Heavy Duty Power Relays
1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of 24 Vac,115 Vac, as required. A metal enclosure shall be provided.

2.8 ELECTROMAGNETIC DOOR HOLDERS

A. Provide single or double door, floor or wall mounted electromagnetic door holder/release devices as indicated on the Drawings. The devices shall be rated for 24V ac/dc input. The devices shall be brushed zinc

finished.

2.9 FIRE ALARM CABLE

A. The fire alarm cable shall plenum rated and be UL listed and suitable for use as power limited fire protective signaling circuit cable in accordance with National Electric Code Article 760 (Fire Alarm Systems) and Article 725 (Class 1, Class 2 and Class 3 - Remote Control, Signaling and Power-Limited Circuits).

B. Cable Construction

1 Conductors shall be solid, soft annealed, uncoated copper.

2 Insulation shall be 300 volt, 105ºC polyvinylchloride.

3 Two conductor, non-shielded cables shall be parallel; shielded and three or more conductors shall be cabled round.

4 Shielding shall be mylar backed aluminum foil, helically wrapped to provide 100% coverage. A suitable copper drain wire shall be provided with shielded cables.

5 Jacket shall be red, 105ºC polyvinylchloride, rated 300 volt.

6 Cable shall be plenum rated when installed in air handling plenums.

C. In general, non-shielded cable is acceptable for use throughout except on voice circuits. All voice circuits shall utilize shielded, twisted pair cable.

PART 3 - EXECUTION

3.1 APPROVALS

A. Complete fire alarm system drawings shall be issued to the Local Authority Having Jurisdiction for approval prior to the installation of the fire alarm system.

3.2 INSTALLATION

A. Installation of the Fire Alarm System shall be in strict compliance with manufacturers recommendations. The entire system shall be installed in accordance with approved manufacturers manuals and wiring diagrams and as approved by the Local Authority Having Jurisdiction.

B. Fire alarm cable shall be installed in conduit in areas of exposed structure and within inaccessible ceilings. Conduit shall also be provided from outlet boxes within walls stubbed up to accessible ceilings. Provide end bushings on conduit stub-ups. Cable only is acceptable in accessible ceilings.

C. All conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation shall be included as part of the system. All junction box blank coverplates shall be labeled with a red “F.A.” for identification purposes.

D. All wiring shall be color coded throughout.

E. The system shall be installed and fully tested under the supervision of trained manufacturer's representatives. The system shall be demonstrated to perform all the functions as specified.

END OF SECTION

SECTION 16726 - INTRUSION / ACCESS INTEGRATED SYSTEM

1.0 GENERAL

1.1 Manufacturer

A. The manufacturer shall have at least thirty-five (35) years of experience in the role of fire and security control manufacturing, and a proven track record of forward and backward compatibility for a minimum of twenty (25) years for its product's auxiliary devices, including system keypads, annunciation devices, zone expansion modules, and addressable detection devices.

B. The manufacturer must also manufacture receiving equipment that is compatible with standard dial-up telephone lines, network, and cellular network monitoring equipment that is compatible with a LAN, WAN, and the Internet. The receiving equipment shall be capable of receiving all status and alarm messages generated by the system. The receiving equipment shall be capable of updating the panel operating program and the system date and time.

C. Commercial Intrusion detection/Access control /Household Fire Alarm Control Panel equipment manufacturer shall be:

Digital Monitoring Products, Incorporated (DMP)
2500 N. Partnership Boulevard, Springfield, MO 65803
Telephone (417) 831-9362FAX (417) 831-1325

1.2 Installer

A. The installing company shall show proof of having regular experience with design, installation, service, and maintenance of manufactured systems for a minimum of the last twelve (12) calendar months from the project start date. Each system installer and service person must provide manufacturer certification of technical training for installation, service, and system maintenance. Certification shall be proven with an official document issued by the manufacturer.

B. The installing company shall provide a minimum of 8 (eight) verifiable references from its clients where the manufacturer's system has been installed within the last twelve (12) calendar months from the project start date.

C. The installing company shall furnish and install a complete electrically supervised DMP panel, as detailed in this specification. The system shall be inclusive of all necessary function, monitoring, and control capability as detailed herein and on accompanying shop drawings.

E. The installing company shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing the work. Materials shall be installed in strict compliance with local building codes. All work shall be performed in accordance with Digital Monitoring Products, Inc. instructions. Components must be installed and serviced by a dealer in good standing that is factory-trained by Digital Monitoring Products.

1.3 Central Reporting Station

A. The central reporting station contractor must possess an Underwriter's Laboratory (UL) listing as a "Mercantile Police Station" or "Mercantile Burglar Alarm Systems" company. A copy of the listing shall be attached as a part of this bid package.

B. The actual alarm signal receipt and processing is a significant portion of the scope of work. Third party and/or contract stations are permitted. UL must list the monitoring station for Protective Signaling Services or Central Reporting Station Signaling Services. A copy of the station UL listing shall be attached as part of this bid package.

C. The monitoring station must provide openings/closing activity reports, activity day and time, authorized individual, office name and account number and the system type being monitored. These reports are to be mailed to the user's office at the end of each month. The Office Manager or Contract Administrator may request an additional report if an incident occurs.

D. The contractor must have a valid Alarm Operator License. A copy of licenses shall be attached as part of this bid package.

E. The contractor may be required to monitor a portion of the alarm systems by way of the end user data network.

F. The contractor shall become familiar with all work details, verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing the work.

G. The end user shall not incur any central station setup charges by the contractor to receive alarm signals by way of the end user data network.

2.0 SCOPE

2.1 Requirements

A. Furnish and install a complete Intrusion Detection/Access Control system with the performance criteria detailed in this specification. The system shall be inclusive of all necessary functions, monitoring, and control capability as detailed herein and on accompanying Shop drawings.

- On-site or remote video monitoring
- Heating, air conditioning, and lighting management
- Temperature threshold detection and monitoring
- Humidity threshold detection and monitoring
- Pressure threshold detection and monitoring
- Power loss detection and monitoring, generator switching
- Leak detection and monitoring
- Carbon Monoxide detection and monitoring
- Tank level threshold detection and monitoring

B. This specification document provides the requirements for the installation, programming, and configuration of a complete DMP panel. This system shall include, but not be limited to:

- Control panel
- System cabinet
- Power supply
- Digital Signaling Line Circuits (SLC)
- Notification Appliance Circuits (NAC)
- Annunciator/keypad bus
- Batteries
- Wiring
- Conduit
- Associated peripheral devices
- Other relevant components and accessories required to furnish and install a complete and operational addressable reporting Life Safety System.

2.2 Standards

The system shall be listed as a Power Limited Device and be listed under the standards below. Each system shall be supplied with complete details on all installation criteria necessary to meet all of the listings.

Burglary Listings	U.S. Government Standards/Listings
UL 1023 Household Burglar Alarm System Units	Meets ICD 705 Chapter 7 Intrusion Detection Systems (IDS)
UL 1076 Proprietary Burglar	Meets DoD/NIST SCIF Standards
UL 1610 Central Station Burglar Alarm Units	Related Standards
UL 1635 Digital Burglar Alarm Communicator System Units	NFPA 70 National Electric Code (NEC)
Fire Listings	NFPA 72 Local Protective Signaling
UL 864 Control Units for Fire Protective Signaling Systems	NFPA 72 Remote Station Protective Signaling
UL 985 Household Fire Warning	NFPA 72 Proprietary Protective Signaling
California State Fire Marshal	NFPA 72 Household Fire Warning
New York City FDNY COA #6167	Canadian Burglary Listings
Access Control Listings	ULC C1023 Household Burglar
UL 294 Access Control System Units	ULC/ORD-C1076 Proprietary Burglar
NIST	ULC S304 Central Station Burglar
AES Algorithm Certificate #2350 128	Canadian Fire Listings
AES Algorithm Certificate #2595 256	ULC S545 Household Fire
	ULC S559 Fire Signal Receiving Centres and Systems

2.3 Americans with Disabilities

All indicating and notification appliances shall comply with the Americans with Disabilities Act (ADA) requirements.

3.0 SUBMITTALS

3.1 General Requirements

The contractor shall submit three (3) complete sets of documentation within thirty (30) calendar days after contract award date. Indicated in the document shall be the manufacturers' names, catalog number, type, size, style, rating, and catalog data sheets for all items proposed to meet these specifications.

3.2 Shop Drawings

Shop drawings shall be submitted in accordance with Section 3.0 Submittals and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions.

3.3 As-Built Drawings

The contractor shall provide a complete set of as-built drawings for the entire system upon installation completion. These drawings shall include, but not be limited to, the exact locations of all equipment, connections between all equipment, and wiring for all equipment as the system is installed.

3.4 Spare Parts Data

After shop drawings are approved, and not later than thirty (30) calendar days prior to the date of beneficial occupancy, a list of spare parts data for each item of specified materials and equipment shall be submitted. The data shall include a complete list of parts and supplies with current unit prices and source of supply. Spare parts shall consist of, but not be limited to, five (5) percent of all initiating and notification appliances with a minimum of one (1) each. All spare parts shall be on site prior to commencement of acceptance testing. Depleted spare parts shall be replaced prior to beneficial occupancy.

3.5 Operating Documents

The contractor shall furnish to the architect operating instructions outlining the step-by-step procedures required for system start-up, operation, and shutdown at least thirty (30) calendar days prior to acceptance test. The instructions shall include the manufacturer's name, system model number, service manual, parts list, and a description of all equipment and their basic operating features.

3.6 Maintenance Documents

The contractor shall furnish maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides at least 30 calendar days prior to acceptance test.

3.7 Performance Test Reports

Upon the installed system completion and testing, test reports shall be submitted in booklet form showing all field tests performed to prove compliance with specified performance criteria.

3.8 Warranty

A copy of the manufacturer's warranty for all equipment and materials shall be provided. Warranty shall be for all equipment, materials, installation, and workmanship for a minimum of three (3) years, unless otherwise specified.

4.0 GENERAL COMPONENT REQUIREMENTS

4.1. Component Enclosure

Housings; power supply enclosures, terminal cabinets, control units, and other component housings, collectively referred to as enclosures shall be so formed and assembled as to be sturdy and rigid. If sheet steel is used in the fabrication of enclosures, it shall be not less than an 18 gauge door with a 20 gauge box frame. Where exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less than 24 inches shall be provided with a single lock. Where the hinged door latch edge is 24 inches or more in length, doors shall be provided with three-point latching device with lock; or alternatively with two locks, one located near each end. For SCIF and High Security applications an attack proof enclosure with proper tampers listed for use with the XR150/XR350/XR550 with Network and Encryption shall be used.

4.2 Electronic Components

A. All system electronic components shall be solid-state type, mounted on printed circuit boards. Light duty relays and similar switching devices shall be solid-state type or electromechanical.

B. The panel shall have an over current notification LED that lights when devices connected to the Keypad Bus and Loop Expansion LX-Bus(es) draw more current than the panel is rated for. When the over current LED lights, the Loop Expansion LX-Bus(es) and Keypad bus are shut down.

4.3 Control Unit

A. A battery test shall be automatically performed to test the integrity of the standby battery. The test shall disconnect the standby battery from the charging circuit and place a load on the battery. This test shall be performed no more than every 180 seconds.

B. The control unit shall be capable of operating and supervising notification appliance devices as well as addressable initiating detection devices and an integrated supervised dual line digital communicator.

C. Control unit must be "Flash ROM" updatable, and program must be held in non-volatile RAM. The panel shall be able to function while the update is in process.

D. Control unit shall be capable of operating using an optional built in Encrypted Alarm Router for SCIF (Sensitive Compartmented Information Facility) application that is certified by NIST (National Institute of Standards and Technology) for 128-bit or 256-bit AES (Advanced Encryption Standard) Encryption communications.

E. The optional built-in Encrypted Alarm Router shall be capable of compliance with ICD 705 Chapter 7 Intrusion Detection Systems (IDS) and UL 2050 standards.

4.4 Remote Annunciators

A. The system shall support a maximum of sixteen (16) supervised remote annunciators with the identical capabilities, functions and display layout. Operation of the remote annunciators shall be limited to authorized users by the use of a code or key.

B. The remote annunciators shall be capable of operating at a maximum wiring distance of 15,000 feet from the control unit on unshielded, non-twisted cable.

4.5 Control Designations

Controls shall be provided to ensure ease of operation of all specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function; controls, switches, visual signals and indicating devices, input and output connectors, terminals and test points shall be clearly marked or labeled on the hardware to permit quick identification of intended use and location.

4.6 Test Function

A. The system shall include a provision that permits testing from any alphanumeric keypad. The test shall include standby battery, alarm bell or siren, and communication to the central station.

B. The system shall include a provision for an automatic, hourly, daily, weekly, thirty (30) day, or up to sixty (60) day communication link test from the control panel installation site to the central station.

C. The system shall include a provision for displaying the internal system power and wiring conditions. Internal monitors shall include the bell circuit, AC power, battery voltage level, charging voltage, panel box tamper, phone trouble line 1, phone trouble line 2, transmit trouble, and network trouble.

4.7 Power Supplies

A. Power supplies for the control unit shall operate from 120 VAC, supplied at the respective protected areas. Standby batteries shall be supplied to power the system in the event of a utility power failure. Batteries shall be sized to provide 105% capacity for eight hours. Standby batteries shall be sealed lead-acid. Power supplies shall be all Solid State.

B. Controls shall be designed to maintain full battery charge when alternating current is available. Batteries shall be recharged to 85% capacity within 24 hours from battery use. The system shall be automatically transferred to battery power upon loss of alternating current power and return to alternating current power upon restoration. Intrusion alarms shall not be initiated during switch over; a signal shall be initiated upon failure of battery or alternating current power.

C. Approved power supplies shall meet or exceed the following power supply model specifications:

- UL Listed DMP 505-12: 12VDC 5 Amp with transformer and enclosure.

4.8 Software

A. The system shall interface with computer software with the capability to fully program the panel by connecting to the panel through:

- Direct cable connection interface card
- Receiver phone line connection
- Standard phone line connection
- Ethernet network connection
- Network connection across the Internet

- Cellular network connection using the 263C or 263H Cellular Communicators

B. The system shall interface with computer software capable of locking down all controlled doors.

C. The system shall interface with computer software capable of monitoring and logging all events.

D. The system shall interface with computer software capable of exporting reports in the following file formats:

Excel spreadsheet (*.xls	Text (*.txt)
Rich Text (*.rtf)	Comma-separated (*.csv)
Windows Metafile (*.wmf)	HTML document (*.htm)
QuickReport (*.qrp)	

E. The system shall interface with computer software capable of printing custom, filtered reports including:

All Events	Door Access Granted
Zone Action	Door Access Denied
Arming/Disarming	Opening/Closing Schedule Changes
Area Late to Close	System Monitors
User Code Changes	System Events

4.9 Graphic User Interface (GUI)

Entré – Access and Security Management Software

System Features:

A. The software shall be available in three package sizes.

Entré Lite™: Shall have 16 doors included, and a maximum of four XR150/XR350/XR550 Series panels, personnel management, full reports, and event management.

Entré Business™: Shall have the same features as Entré Lite with the option of expansion to 96 doors maximum and up to 24 XR150/XR350/XR550 Series panels.

Entré Enterprise™: Shall have the same features as Entré Business with 96 doors included with the ability to expand to an unlimited number of doors, users and XR150/XR350/XR550 Series panels.

B. Shall have simple user management, with the ability to import users from existing databases.

C. Shall be able to assign user access by group, facility or other parameters.

D. Shall have drop down lists for devices, user data and other information to facilitate fast and accurate searches.

E. Shall be able to view system status in one of a variety of views for simplified alarm monitoring management.

F. Shall have the capability to customize reports for added flexibility.

User Management:

A. It shall have the ability to import into Entré from existing systems via standard comma-separated value (CSV) format files. It shall easily add new users, capture and edit their photo for badging or visual verification from within the application.

B. User fields shall be fully customizable. Assign specific rights or events by user or by group. The software shall be able to create effective/expiration time for users, limiting access to only certain times of the day, and only certain days, or for only a defined period of time.

AES Encryption:

A. Entré Enterprise shall support the XR550 Series with Encryption panel AES (Advanced Encryption Standard) strong data security for sensitive personnel and facility data.

Highly Customizable:

A. The software shall be extensively customizable to create a system that matches the end user's application's needs.

B. Shall define what events are considered "alarms," and what response is required from the system operator.

C. Shall be able to tailor user data with up to 20 available user-defined fields.

Hierarchical Views:

A. The software shall have the ability to select from four different system views, with the ability to have multiple views open simultaneously. Select the graphical Map view, tabular Event view, or hierarchical Tree view.

B. The software shall be able to click on a device or alert to access additional information and process the event. In text-based views, software shall have simple drill downs to allow fast navigation to the desired item.

Powerful Search:

The software shall employ industry standard SQL database for quick and easy search to identify any desired device or user which is compatible with nearly any database.

Single-System Control:

The software shall employ a network solution to manage installations and users from any location. A single, unified database means there's one badge, one face or one fingerprint, worldwide.

Entré – Access & Security Management Software

Optional System Modules:

- ENTRE-4DR Additional 4-Doors
- ENTRE-16DR Additional 16-Doors
- ENTRE-32DR Additional 32-Doors
- ENTRE-64DR Additional 64-Doors
- ENTRE-STD Standard Client
- ENTRE-WEB Web Client
- ENTRE-MAPS Alarm Graphics
- ENTRE-AUTO Automation Module
- ENTRE-DVR DVR Module
- ENTRE-PART Database Partitioning
- ENTRE-LANG Multiple Language module
- ENTRE-LDAP Lightweight Directory Access Protocol
- ENTRE-IMAGE Personnel Image Capture
- ENTRE-BADGE Badge Designer
- ENTRE-SIGN Signature Capture

Optional System Modules Features:

A. Shall be able to Point-and-click control of alarms and devices.

B. Shall have a modular design to enable customization, with optional modules for added features.

C. Shall be available in French, Spanish, or English, with dual- language operation mode.

D. Shall have full reporting, including at-a-glance dashboard graphics and charts or traditional tabular displays, with the ability to produce reports in a variety of file types.

E. Shall have DVR integration.

F. Shall have image management of users and event photos.

G. Shall have a custom badge builder and video badging.

Door Modules:

The software shall allow for the addition of additional doors to support Entré Business or Enterprise systems.

Alarm Graphics:

A. The software shall allow for the addition of additional doors to support Entré Business or Enterprise systems.

B. Shall have the ability to give graphical representation of events and alarms at-a-glance and give feedback of system status.

C. Shall have the capability to upload an unlimited number of graphical images of protected facilities in a variety of file formats.

D. System maps are linked from level to level, allowing drill down from a macro view to a specific room or area.

E. View alarm status at every level of zoom.

F. User-defined layers representing different alarm types allow you to customize the graphical interface to meet application needs.

G. Once loaded, it shall have the ability to plot alarm devices on the graphics using drag-and-drop selections from a hierarchical list of hardware. Identify the areas on your site maps, defining them by Classification, Entrances, Zones, and Partitions.

H. It shall have total picture-based monitoring and control of the system. It shall from facility-wide views be able to click to zoom in on any area of the facility and view the real-time status of any device.

I. The software shall be able to click on the alarm display icon to acknowledge an alarm or to request additional information

Automation Module:

A. The software shall be able to give advanced users the power to create automated system actions.

B. The software shall be able to define automatic responses to any system alarm or events. These include generating a report, generating an alert email, or sending commands to selected devices.

C. Shall be able to create scheduled system actions to run once at a specified time and date, or scheduled events that repeat at user defined time and date intervals.

D. System automation enables configuration of unattended activities, freeing system managers from many routine responsibilities.

DVR:

A. The software shall be able to quickly connect to a DVR to review video based on a received alarm from a control panel.

B. Connect to DVR from a graphical map of the area to review activity.

- Verint
  - NetDVR I, firmware 6.47.x or higher
  - NetDVR II, firmware 8.7.x or higher
  - EdgeVR, all firmware versions
- 3VR
  - E-Series
  - P-Series
  - S-Series
  - ServerClass
- March Networks™
  - 3204 Digital Video Recorder (3000 Series)
  - 4000 C NVR (4000 C Series)
- Dedicated Micros
  - All NetVU compatible series 2 and 3 DVRs

Database Partitioning:

A. The software shall allow system information to be contained in a single unified database allowing system managers to limit user access to only certain areas of the database to partition the information.

B. The software shall allow organization of data into separate collections by physical area, hardware types, events, or other parameters.

Multi-Language:

A. The software shall support multiple languages enabling multiple operators to select a language during their login process. The software shall allow text shown both in English and a second selected language.

B. Available languages shall include:

- English
- French
- Spanish

LDAP (Lightweight Directory Access Protocol):

A. The software shall provide LDAP single sign-on for users, enabling them to use one password to access multiple system services.

B. System user information can be imported directly from an existing LDAP Tree.

Badge Image Capture:

The software shall allow the transfer of pictures of users from a digital camera directly onto a badge. Select a TWAIN source to capture the image to allow up to date images on employee badges.

Badge Designer:

A. The software shall have the ability to create one or more badge designs, customizing badges by facility, user level, or other parameters.

B. When badging employees or visitors, select the desired badge template from library. The template automatically populates with the appropriate data, ready for printing.

Signature Capture:

Shall use a signature capture device to provide the ability to capture employee or visitor signatures and store the images.

Reporting Dashboard:

A. The software shall have interactive graphics for instant feedback on system activity.

B. The software shall be able to choose a number of charts for functions such as Access Granted /Denied at a particular access point or an entire facility to get a snapshot of activities within any defined time period.

C. Shall have ability to filter through user, activity, or event data to narrow results and show precisely the information needed.

D. Shall have the ability to view reports from within the application, or saved and exported to PDF, HTML, XLS, CSV, or XML format for distribution.

E. Shall automate custom reports to generate and distribute each day at desired times.

4.10 Control Panel Capability

A. The basic control panel shall provide:

- Expansion to a total of at least 10,000 user codes with 99 user profile definitions.
- Temporary user codes that can be entered with a finite date and specific time to expire.
- Sixteen (16) independent door/keypad addresses, each with four zones on XR550 and XR350, with eight (8) on the XR150.
- A total door access granted event buffer of at least 10,000 events.
- Anti-passback access control selectable by area and user.
- A total of at least 99 programmable Schedules for output relay schedules, area schedules, door schedules, holiday schedules, and user profiles. The same schedule may be assigned to more than one area, door, or output, making them reusable. There shall be at least two schedules per user profile with up to four profiles per user. Up to 8 Schedules per user, per door, per area, and per output.
- Eight Areas (8) individual reporting areas XR150, Sixteen (16) individual reporting areas XR350, and Thirty-two (32) individual reporting areas XR550.
- Built-in bell and telephone line supervision.

B. The networked control panel shall provide the entire above plus:

- All of the above features plus.
- Require two-man access code or credentials. Require two user code entries to disarm and/or allow door access to this area.
- Support programming to require the same or different access code entered within a programmed delay time of 1 to 15 minutes after disarming before activating a silent ambush alarm.
- Early Morning Ambush. Must disarm a second time with in a programmed period of time or an early morning ambush silent alarm is sent.
- Bank Safe & Vault features. Schedules set for this area and the time of day cannot be changed while the area is armed.

C. The XR550 encrypted control panel shall provide the entire above plus:

- All of the basic and network features listed plus.
- Built-in Encrypted Alarm Router.
- Certified operation that meets NIST (National Institute of Standards and Technology) standards for 128-bit and 256-bit AES (Advanced Encryption Standard) Encryption.
- Certification that encrypted panel is capable of meeting ICD 705 Chapter 7 Intrusion Detection Systems (IDS) Standard.
- Certification that encrypted panel is capable of meeting UL 2050 standards.
- Card plus Pin for High security card access is provided by the Card Plus Pin feature that requires both a card read and a PIN (4-6 digit user ID) entry for arming/disarming and access by area. This Card Plus Pin operation complies with the ICD 705 requirement for dual id authentication and operates with a DMP Prox Keypad and a HID ProxPro reader with the keypad connected to a DMP Wiegand Interface module.
- Panic Test allows the panic zone test verification and failure results to be sent to the central station receiver.

- Passphrase of 8-16 characters to validate encryption between the XR550 with Encryption and the Central Station Receiver.

5.0 FUNCTIONAL DESCRIPTIONS

5.1 System Description

A. The system areas and zones shall be programmable, and the system shall store, log, display, and transmit specific custom designations for system areas, zones, and user names.

B. To ensure continued, one-call support, the system shall be constructed of sensing components provided directly by the system manufacturer, such as power supplies, motion detectors, door and window position switches, glass break detectors, or other sensing devices that the manufacturer offers.

C. The system controller, user interfaces, zone input devices, relay output devices, and the system signal receiving equipment shall be engineered, manufactured, assembled, and must be distributed from a location within the United States of America.

D. The system shall support user interaction by way of a keypad, web browser, system software, key switch, or radio frequency wireless control, Text messaging, or Smart Phone Application using integrated or auxiliary devices provided by the system manufacturer.

E. The system shall support controller zone input connections, system keypads, system zone expansion modules, and wireless zone input modules, and must support zone input connections by way of at least two competitive products. The system shall offer a seamless integrated compatibility with hard-wire and/or wireless zone expansion equipment for at least 500 wireless zones and/or a maximum of 574 hardwired zones.

F. The system shall be capable of offering up to five zone expansion buses, each of which can support the connection of up to 15,000 feet of four-wire cable. Zone expansion and keypad data buses that exceed 2,500 feet of cable must include splitter/repeater modules to boost data voltage and maintain data integrity.

G. The system shall provide a seamless capability to provide up to 506 addressable relays, which can be located at any connection location upon a zone expansion bus.

H. System relay outputs shall have the capability of being triggered as a result of a command from the user interface, changes in system status, changes in zone status, or by a programmable schedule.

I. System relay output states shall be programmable for momentary, maintained, pulsed, or must follow the state of an associated system zone input.

J. The system shall be completely programmable either locally from a keypad or remotely through a standard dial-up, and network connections by way of a LAN, WAN, and/or by way of the Internet, cellular communications paths.

K. The control unit shall be completely programmable remotely using remote annunciators, and/or using upload/download software that communicates using SDLC 300 baud, 2400 baud, or IP Addressed data network. On-site programming from a personal computer shall also be permitted.

L. The control unit shall be equipped with an anti-reversing circuit breaker to prevent damage due to accidental reversal of battery leads.

5.2 Input/output Capacity

A. This system shall be capable of monitoring a maximum of 574 individual zones and controlling a maximum of 506 output relays.

B. The control panel shall have, as an integral part of the assembly, 2 SPDT Form C relays rated at 1 Amp at 30 VDC and four open collector 12 VDC outputs rated at 50mA each. It shall also have the capacity of a maximum of 125 output expander modules with 500 switched ground, open collector outputs, 50mA maximum and 506 auxiliary relays (Form C rated at 1.0 Amp at 30 VDC).

C. The panel shall also provide 99 programmable output profiles for schedules, and include an integral bell alarm circuit providing at least 1.5 Amps of steady, pulsed, or temporal bell output. Output type shall be programmable by zone type. Relays and voltage outputs shall be capable of being independently programmed to turn on and/or off at selected times each day.

D. The system shall be capable of supporting and controlling up to 232 Z-Wave devices and up to 20 Z-Wave Favorites for group control.

5.3 User/Authorization Level Capacity

The system shall be capable of operation by 10,000 unique Personal Identification Number (PIN) codes with each code having one (1) of ninety-nine (99) custom user profiles. This allows for limitation of certain functions to authorized users. The operation of all keypads shall be limited to authorized users.

5.4 Keypads

A. The system shall support a maximum of sixteen (16) keypads on XR550/XR350 Series or eight (8) keypads on XR150 Series with alphanumeric display. Each keypad shall be capable of arming and disarming any system area based on a pass code or Proximity key authorization. The keypad alphanumeric display shall provide complete prompt messages during all stages of operation and system programming and display all relevant operating and test data.

B. Communication between the control panel and all keypads and zone expanders shall be multiplexed over a non-shielded multi-conductor cable, as recommended by the manufacturer. This cable shall also provide the power to all keypads, zone expanders, output expanders, and other power consuming detection devices.

C. If at any time a keypad does not detect polling; the alphanumeric display shall indicate “SYSTEM TROUBLE”. If at any time two devices are programmed for the same address, the alphanumeric keypad shall display “4 WIRE BUS TROUBLE”. If at any time a keypad detects polling but not for its particular address, the alphanumeric display shall indicate “NON POLLED ADDR”. The system shall display all system troubles at selected keypads with distinct alphanumeric messages.

D. The keypad shall include self-test diagnostics enabling the installer to test all keypad functions: display test, key test, zone test, LED test, relay test, tone test, and address test.

E. The keypad shall provide an easy-to-read English text display. The text shall exactly match the text seen in all software reports, keypad displays, and central station reports.

F. The keypad user interface shall be a simple-to-use, menu-driven help system that is completely user friendly.

G. The control panel shall support a keypad interface accessible on the World Wide Web in a browser window. The web-accessible keypad interface shall provide at least five (5) programmable hyperlinks for camera access or other use.

5.5 Zone Configuration

A. A minimum of 4 Class B ungrounded zones shall be available at each keypad or zone expander on the system. The system shall have the capacity for a maximum of sixteen (16) keypads and a maximum of 125 four (4) zone expanders or 500 single zone expanders on the XR550. It shall also have the capacity of a maximum of 125 supervised relay output expanders. The XR350 shall have the capacity for a maximum of sixteen (16) keypads and a maximum of 125 four (4) zone expanders. It shall also have the capacity of a maximum of 75 supervised relay output expanders. The XR150 shall have the capacity for a maximum of eight (8) keypads and a maximum of 25 four (4) zone expanders It shall also have the capacity of a maximum of 25 supervised relay output expanders. All Class B zones shall be 2-wire, 22 AWG minimum, supervised by an end-of-line (EOL) device and shall be able to detect open and short conditions in excess of 500ms duration.

B. Each zone shall function in any of the following configurations: Night, Day, Exit, Fire, Supervisory, Emergency, Panic, Auxiliary 1, Auxiliary 2, Fire Verification, Cross Zone, Priority, and Key Switch Arming.

C. The digital SLCs and the annunciator/keypad bus shall be able to operate at a maximum wiring distance of 2500 feet from the control panel on unshielded, non-twisted cable. This distance may be extended to a total of 15,000 feet when bus repeater modules are installed.

D. Each zone shall function in any of the following configurations:

Night	Supervisory	Auxiliary 1	Cross-Zone
Day	Emergency	Auxiliary 2	Priority
Exit	Panic	Fire Verification	Arming
Fire			

5.6 Communication

A. The system shall be capable of signaling to as many as 8 remote monitoring station receivers. Seven (7) of the eight (8) paths shall be capable of being assigned as either a “primary” or “backup” path. In such a manner the system shall have multiple primary paths to multiple remote monitoring stations as well as multiple backup paths to multiple monitoring stations.

B. The system shall employ Adaptive Technology that allows a Backup communication path programmed for Network or Cellular to automatically ADAPT to the faster check-in rate of the Primary path should the Primary path become unavailable. This creates a seamless transition for communication.

C. The system shall be capable of dialing up to (2) remote monitoring station receivers, four telephone numbers of 32 digits each using two separate switched telephone network lines such that if two unsuccessful attempts are made on the first line to the first number, the system shall make two attempts on first line to the second number. If these two attempts are unsuccessful, the system shall make two further attempts on the first line of the first number. After the tenth unsuccessful attempt, dialing shall stop and the alphanumeric keypad shall display trouble. Should another event occur that requires a

report to be transmitted, the dialing sequence shall be repeated. The system shall have a programmable option to dial a second set of telephone numbers after the first ten attempts using the same sequence.

D. The system shall be capable of communication using the IBM Synchronous Data Link Control format, and at least one other standard industry format.

E. The system shall be capable of supporting Network communication with digital dialer backup, existing Ethernet data networks, satellite communication, fiber optic networks, local area networks, wide area networks, cellular communication, and retail data networks.

5.7 Network Communication

A. The control panel shall be capable of asynchronous network communication with a retry time between 2 and 240 minutes and a fail time of 2 and 240 minutes. If communication is unsuccessful the control panel shall be capable of attempting backup communication through any of the available communication methods to the same receiver or a backup receiver.

B. The control panel shall employee adaptive communication technology. Adaptive Technology allows a Backup communication path programmed to use Network or Cellular to automatically ADAPT to the faster check-in rate of the Primary path should the Primary path become unavailable, creating a seamless transition for communication of messages. Select Adapt when programming the Checkin option. This allows a system to be fully supervised even if a path fails, while also keeping wireless charges low when the network is good.

C. Network communication between the control panel and the receiver shall be in a proprietary communication format.

D. The control panel shall be capable of supporting Dynamic Host Communication Protocol (DHCP) Internet Protocol (IP) addressing.

E. Underwriters Laboratories (UL) shall list network communication by the control panel for Standard or Encrypted Line Security.

F. The control panel shall be capable of two-way network communication using standard Ethernet 10/100 BaseT in a LAN, WAN, or Internet configuration.

G. The control panel shall be capable of communication by means of a 128-bit or 256-bit AES (Advanced Encryption Standard) Encryption process certified by NIST (National Institute of Standards and Technology) to an SCS-1R receiver with an SCS-104 line card or SCS-VR (SCS-VR currently supports 128-bit encryption only).

H. The control panel shall be capable of meeting ICD 705 Chapter 7 Intrusion Detection Systems (IDS) and UL 2050 standards.

I. The control panel shall be capable of sending text messaging to up to three Cellular Phone Numbers using cellular communications.

J. The control panel shall be capable of sending the following SMS messages:

Zone Alarms by Zone Name	AC Power Trouble and Restoral
Zone Troubles by Zone Name	System Low Battery
Zone Bypass by User	Ambush
Arming (Closings) by User	Abort, Cancel and Alarm Verified by User
Disarming (Openings) by User	Check-in by user
Late to Close	

5.8 Cellular Communications

A. The control panel shall have the capability to communicate with a plug-in cellular HSPA+ communicator model number 263H or CDMA communicator model number 263C that shall plug into the control panel J24 connector which shall supply full data communication and power to the 263H or 263C cellular communicator. The cellular communicator shall be capable of communicating full panel alarm and auxiliary messages to the DMP SCS-1R Central Station or SCS-VR Receiver as well as SMS text messaging to a PC, PDA, or Cellular telephone.

B. The control panel shall be capable of sending the following SMS messages

Zone Alarms by Zone Name	AC Power Trouble and Restoral
Zone Troubles by Zone Name	System Low Battery
Zone Bypass by User	Ambush
Arming (Closings) by User	Abort, Cancel and Alarm Verified by User

Disarming (Openings) by User	Check-in by user
Late to Close	

5.9 TCP/IP Network Trapping

A. The control panel shall be capable of having communication set to Network operation. When a trap is set in Remote Link, the software shall be capable of sending a panel trap message with the panel account number to the SCS-104 installed in an SCS-1R receiver.

B. The receiver SCS-104 shall store the trap and monitor the panel for the next message. When the panel sends its next message, the receiver SCS-104 shall then send a message to the panel to contact Remote Link at the IP address contained in the original trap message.

C. The trap message shall be stored in the receiver SCS-104 for up to four hours. If the trap message is not sent to the panel within the four-hour window, the panel trap message shall be discarded and a new trap message must be sent from Remote Link.

D. The user shall be able to view the trap status in the receiver SCS-104 in Remote Link using the Trap Query function.

6.0 INTEGRATED INTRUSION ALARM AND ACCESS CONTROL OPERATION

6.1 Access Authority Levels

The system shall be capable of programming access credentials authority levels to check whether the user has access to a specific area and also has the authority to disarm or arm the area. If the user access credential has access and disarm/arm authority the system shall provide the user the option to disarm the area simultaneously upon opening the door, or to open the door and begin an entry delay timer. With the timer option the user then disarms the area using an intrusion control keypad inside the area. If the user only has access authority to the area and the area is in an armed condition, the user is denied access to the area.

6.2 Door Open Schedule Override

The system shall be capable of programming certain area doors to be scheduled to unlock and lock at specific times of the day or night. The lock/unlock function shall be capable of an override option depending upon the area armed/disarmed status. If the area remains in an armed status at the scheduled unlock time the armed status overrides the unlock schedule ensuring the doors remain locked and armed in situations where the business might open late, close early, is affected by inclement weather, or another emergency.

6.3 Common Area

The system shall be capable of programming a common area to be armed when the last area in the system is armed and disarmed when the first area in the system is disarmed. To ensure the common area works properly it shall not have any user codes assigned to the common area. The system shall also be capable of programming multiple common areas.

6.4 Area Access Control

A. The system shall be capable of integrating area access control capability where specified into the same control panel with the ability to have up to 10,000 user credentials. User access is limited to custom profiles and/or schedules. Anti-passback shall be available. The networked version shall support a Two-Man Rule feature. The system shall support up to sixteen (16) access doors, connected to the system using a manufacturer-approved interface module.

B. Area door access products shall meet or exceed features offered by the following products:

- Keypad reader/administration device – DMP Model 7063/7063A, 7073/7073A, 7163/7173, 7872, 7873
- Wiegand Interface – DMP Model 734, 734N, or 734N-WIFI
- Reader – DMP Model PP-6005B, Model PR-5455, Model MP-5365
- Cards or credentials – DMP Model 1326, DMP Model 1306P, DMP Model 1346, DMP Model 1386

6.5 Access Control Equipment

Access Control equipment shall communicate to the system by way of the control panel keypad bus. The equipment shall have a three (3) year warranty and meet or exceed features offered in the products listed in Section 11.5 of this document.

6.6 Early Morning Ambush (XR550 only)

A. The system shall be capable of programming an area to require two user codes be entered within a programmed number of minutes to prevent an ambush message from being sent to the Central Station Receiver. If both user codes are not entered within the time an ambush message is sent to the central station receiver.

B. Both user codes shall have the authority to disarm the specific area and must be entered at the same keypad or reader. The keypad shall not display any indication that the ambush timer is running.

C. The system shall be capable of programming an output to provide an external indicator that an ambush situation is taking place.

6.7 Two-Man Rule (XR550 only)

The system shall be capable of programming an area to require two separate user codes be entered in order to disarm and/or allow access to a specific area. Both required codes shall have at least the same or greater authority level. Both required codes shall be entered within 30 seconds or an alarm shall activate.

6.8 Panic Button Summary Test

A. The system shall have the ability to test panic buttons without sending a panic alarm to the Central Station Receiver.

B. The system shall also have the ability to send panic zone test verification and failure results to the Central Station Receiver.

C. During the test, each time a panic zone trips, the display number shall increment and the keypad buzzer sound for two seconds.

D. The number of panic zones tripped shall constantly display until the test ends or no panic zone activity has occurred for 20 minutes.

E. When the Panic Zone Test ends and a zone failed (did not trip) during the test, the keypad shall be able to display the zone name and number and have the buzzer sounds for one second. Additional zone failed zones shall display when a button is pressed.

6.9 One-man Walk Test

A special code is also available for installers to test the system. The One-Man Walk Test feature allows a single technician to check the panel response to burglary, fire, panic, and supervisory zones.

6.10 Multi-lingual Display Option

The system shall be programmed to display the User Menu and Status Display text in multiple languages.

6.11 User Inactivity Audit

System shall allow user code inactivity to notify the central station after a programmable period of days of no activity. The system shall be programmable from 0-365 days.

6.12 Lock Down

The system shall for emergency situations, a lock down command can be issued from the keypad menu or via remote command and locks all doors designated as public.

6.13 Communication Function Diagnostics

The system shall have enhanced diagnostic menu that enables technicians to check network and cellular communication status and cell signal strength from the keypad.

6.14 GUEST Operation

The system shall be capable of in the Home/Sleep/Away with Guest House operation, create up to three separate systems (main and two guests). Keypads in each system can selectively arm the perimeter, interior, or bedrooms for only their protected areas. Main system users can add authorized users to all protected areas, but guests can add users only for their protected system.

7.0 FALSE ALARM REDUCTION FEATURES

The system shall be capable of providing false alarm reduction features, functions, capabilities, or processes that either require alarms be verified or potential alarms be corrected before a system or zone can be placed into an armed state.

7.1 Exit Error Alert and Reporting

The panel shall be able to provide an automatic function to prevent a false alarm from occurring if an exit door does not properly close after the system is armed.

7.2 Entry and Exit Delay Annunciation

A. When arming, the system shall provide clear annunciation indicators to the user about the need to exit the premises prior to the exit delay time expiring.

B. When disarming, the system shall notify the user the need to disarm the system prior to the entry delay time expiring.

7.3 Remote Annunciation

The system shall be able to provide entry and exit delay time period notification. This notification can be from DMP keypads, remote annunciators, or bell tests.

7.4 Abort Reporting

The system shall be capable of sending an Abort report to the central station if the system is disarmed while the alarm is still sounding. The Abort report shall be sent after the alarm report to notify the central station that an authorized user has cancelled the alarm.

7.5 System Testing

The system shall offer testing features that are simple, quick, and complete and provide the highest measure of safety by ensuring that alarm conditions are detected and communicated to the proper authorities in a timely manner and on a regularly scheduled basis.

7.6 Ambush Code

The system shall offer ambush codes for those dangerous encounters where the user is instructed to either arm or disarm the system under threat of harm. The duress code shall disarm the system without giving local indication of an alarm that might put the user well-being in jeopardy.

7.7 Two-Button Panic Feature

The system shall support DMP keypads that provide the option to use only two-button panic codes. The user shall be required to press and hold two designated keys for approximately two seconds before the system generates a panic alarm.

7.8 Fire Verify Zones

The system shall support Fire Verify zones to help the panel verify the existence of an actual fire condition before it sends an alarm report to the central station. The Fire Verify zone shall require the panel to perform a Sensor Reset whenever a device connected to a Fire Verify zone initiates an alarm. This shall begin a verification period during which the panel waits for a second alarm initiation. If the original zone or any other Fire Verify zone on the panel initiates an alarm within the next 120 seconds, the panel shall recognize this as an actual alarm and send an alarm report to the central station.

7.9 Cross-Zoning Protection

The system shall support cross-zoning as a means of requiring two device trips to occur within a short period of time before sounding an alarm and sending an alarm report to the central station. Supported device trips shall be from one device that trips two times, or from two devices that each trip once.

7.10 Swinger Zone Bypassing

The system shall be capable of automatically bypassing a zone if it goes into an alarm or trouble condition a specified number of times within a one-hour period. The panel shall be able to track the number of times the zone trips while armed and compare that against a programmed number. When that number is reached, the panel shall be able to automatically bypass the zone. The panel shall be capable of resetting the zone when the area to which it is assigned disarms, is manually reset from the keypad or remotely, or remains normal for one hour.

7.11 Recently Armed Report

The system shall be capable sending a System Recently Armed report, along with a zone alarm report, to the central station any time an alarm occurs within five minutes of the system arming. The System Recently Armed report allows the central station operator to follow a “call the subscriber first” procedure instead of immediately dispatching the police to what could be a false alarm.

7.12 Transmit Delay

The system shall be capable of programming the panel to wait up to 60 seconds before sending burglary alarm reports to the central station. If an alarm is accidental, the user shall be able to disarm the system within the programmed Transmit Delay time. An Abort report shall be sent in place of an alarm report after the system disarms. During the alarm, sirens and panel relay outputs shall not be delayed and shall still provide local condition annunciation.

7.13 Call Waiting Cancel

The system shall be capable of being programmed to cancel call waiting any time the panel dials the receiver number to send a report.

7.14 Cancel/Verify

The system shall be capable of sending either a Cancel Report or Verify Report to the Central Station to signify that the end user has Canceled an Alarm or Verified an Alarm condition. Also the system shall be programmable to instead of Cancel/Verify show “IS THIS A FALSE ALARM? NO YES”. If YES send validation of alarm to Central Station, if NO send alarm cancel.

8.0 Must meet ANSI/SIA CP-01-2010 Standards for False Alarm Reduction

The system shall be capable of meeting ANSI/SIA CP-01-2010 Standards for False Alarm Reduction.

8.1 Shall Meet Exit Delay Standards

- Default – 60 seconds (Minimum 45 seconds)
- Progress Annunciation – different sound last ten seconds of delay
- Automatic Restart of running exit delay, one time upon re-entry
- Recent Closing – signal sent if alarm within 2 minutes of Exit time expiration (change from 5 min)
- Exit Error – Immediate local alarm and entry delay starts

8.2 Shall Meet Entry Delay Standards

- Default – 30 seconds (Minimum 30 seconds)
- Pre-Warning Silenced – after first digit code entry
- Cancel Message sent if disarmed after alarm sent

8.3 Shall Meet Fail-to-Exit Standards

When perimeter and exterior areas are defined and the user does not leave the building before the system arms, the system only arms the perimeter and leaves the interior unarmed

8.4 Shall Meet Automatic Restart Standards

The system shall stop the Exit countdown once and restart it to allow the user to pick up a forgotten jacket or briefcase and exit the building without sending an alarm to the central station.

9.0 NOT USED

10.0 BURGLARY CONTROL SPECIFICATIONS

10.1 Burglary Standards

The Burglary system shall be listed as a Power Limited Device and be listed under the standards below. Each system shall be supplied with complete details on all installation criteria necessary to meet all of the listings.

Burglary Listings	Canadian Burglary Listings
UL 1023 Household Burglar Alarm System Units	ULC C1023 Household Burglar Alarm System Units
UL 1076 Proprietary Burglar	ULC/ORD-C1076 Proprietary Burglar
UL 1610 Central Station Burglar Alarm Units	ULC S304 Central Station Burglar Alarm Units
UL 1635 Digital Burglar Alarm Communicator System Units	
U.S. Government Standards	
Meets ICD 705 Chapter 7 Intrusion Detection Systems (IDS)	
Meets DoD/NIST SCIF Standards	
Meets ANSI/SIA CP-01-2010 False Alarm Reduction	

10.2 Area System Mode

A. The system user shall be capable of selectively arming and disarming any one or more of 32 areas within the intrusion detection system based on the user PIN code and/or keypad used. Each of the 574 zones shall be able to be assigned to any of the 32 available areas. The system shall be capable of having up to a thirty-two (32) character length name programmed for each area.

B. The system user shall be capable of assigning an opening and closing schedule to all areas or to each of the 32 areas separately. Each area shall be able to arm or disarm automatically by a schedule. The system shall have the capacity for common areas that automatically disarm when any other area disarms and that automatically arm when all others areas arm.

C. The networked system shall have the ability to comply with Bank Safe & Vault application. The networked system shall also have the ability to use a two-man rule for disarming or allowing door access to an area. The system shall have the ability to operate a Common Area application.

D. The Encrypted system shall have the feature of Card Plus Pin by area High security card access is provided by the Card Plus Pin feature that requires both a card read and a PIN (4-6 digit user ID) entry for arming/disarming and access by area. This Card Plus Pin operation complies with the ICPG 705 requirement for dual id authentication and operates with a DMP Prox Keypad and a HID ProxPro reader with the keypad connected to a DMP Wiegand Interface module.

10.3 Home/Sleep/Away Mode

The system shall be capable of being configured in a Home/Sleep/Away configuration for Residential applications. The system shall consist of a Main House system and up to two Guest House systems within one single control Panel with each house being controlled with its own keypad as if it were separate alarm systems.

10.4 All/Perimeter Mode

The system shall be capable of being configured into the All/Perimeter configuration to enable the selective arming of both the interior and perimeter when armed "All" or arming just the perimeter devices if arming "Perimeter".

10.5 Zones

The system shall have a minimum of eight (8) grounded burglary zones available from the control panel, and two floating ground powered zones for two wire type compatible smoke detectors. The system shall have the ability to expand using the panel's keypad bus for up to sixty-four additional zones. The system shall also have five built-in zone expansion bus (LX500 – LX900) for an additional 500 zones of expansion. The system shall have the ability to integrate up to 500 wireless zones for a total of 574 zones overall.

10.6 Burglary Equipment

Burglary detection equipment shall communicate to the system by way of the control panel loop expansion bus or 900MHz bi-directional spread spectrum receiver. The detection equipment shall have a three (3) year warranty and meet or exceed features offered in the products listed in Section 11.0 of this document.

10.7 Z-Wave Equipment

The system shall be capable of 232 Z-Wave devices by means of the use of the model 738Z module. The system shall have the capability of up to 20 Z-Wave favorites for grouping Z-Wave devices into a favorite response or control.

11.0 ACCESS CONTROL SPECIFICATIONS

11.1 Access Control Standards

The access control system shall be listed as a Power Limited Device and be listed under the standards below. Each system shall be supplied with complete details on all installation criteria necessary to meet all of the listings.

Access Control Listings	U.S. Government Standards
UL 294 Access Control System Units	Meets ICD/ICS 705 Chapter 7 Intrusion Detection Systems (IDS)
	Meets DoD/NIST SCIF Standards

11.2 Keypad

A. The system shall display a message at any keypad when any system area remains disarmed past the scheduled closing time. The message shall be displayed at one minute past the scheduled closing time. A pre-warn tone shall also begin sounding. If the system is not armed or a schedule extended within ten minutes past the scheduled closing time, the system shall provide the option of sending a Late to Close report to the central station.

B. The keypad shall include a door strike relay capable of sending a report to the central station when activated.

C. The keypad shall be capable of proximity arming and disarming functions.

D. The keypad shall display red backlighting when in alarm condition notifying an individual of an unacknowledged alarm condition.

E. The keypad shall annunciate when canceling an alarm condition the words "Cancel" or "Verify" to allow the end user the ability to cancel a user generated alarm or to select verify to send a message to the central station that the alarm has been verified by the end user and to send emergency response personnel. This is to comply with Alarm Verification.

11.3 Area Access Control

A. The system shall be capable of integrating area access control capability where specified into the same control panel with the ability to have up to 10,000 user credentials. User access is limited to custom profiles and/or schedules. Anti-passback shall be available. The networked version shall support a Two-Man Rule feature. The system shall support up to sixteen (16) access doors, connected to the system using a manufacturer-approved interface module.

B. Area door access products shall meet or exceed features offered by the following products:

- Keypad reader/administration device – DMP Model 7063/7063A, 7073/7073A, 7163/7173, 7872, 7873
- Wiegand Interface – DMP Model 734, 734N, or 734N-WIFI
- Reader – DMP Model PP-6005B, Model PR-5455, Model MP-5365
- Cards or credentials – DMP Model 1326, DMP Model 1306P, DMP Model 1346, DMP Model 1386

11.4 Access Control Equipment

Access Control equipment shall communicate to the system by way of the control panel keypad bus. The equipment shall have a three (3) year warranty and meet or exceed features offered in the products listed in Section 11 of this document.

12.0 COMPILED DETECTION EQUIPMENT LISTING

12.1 Hard-wired

Hard-wired detection equipment shall communicate to the system by way of the control panel loop expansion bus. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:

- Network Transient Suppressor – DMP Model 270
- Trouble Sounder – DMP Model 277
- Bus Splitter/Repeater Module – DMP Model 710
- Door Contact – DMP Model SM-20WG (surface applications – requires DMP zone expander)
- Output Expansion Module - DMP Model 716
- Graphic Annunciator Module - DMP Model 717
- Dual Phone Line Module – DMP Model 893A

Other product types shall connect directly to zone expansion modules such as:

- Addressable - DMP Models 521LX, 521LXT, 850S/711, 850D/711
- Non-Addressable - DMP Models 521B, 521-BXT, 850S, 850D
- Addressable - DMP Model 711
- Addressable - DMP Models 714, 714-8, 714-16
- Addressable - DMP Models 712-8
- Addressable - DMP Models 715, 715-8, 715-16
- Manual Fire Alarms – DMP Models 850S, 850D

12.2 Wireless

Wireless detection equipment shall communicate to the system by way of a compatible 900MHz receiver utilizing two-way communications, capable of receiving up to 500 wireless zones. The wireless system shall be programmed directly from the control panel, and shall not require a separate device programmer. The wireless detection equipment shall have a one (1) year warranty. It shall be capable of sending transmitter and battery status to the control panel's compatible receiver up to once every 60 seconds and must meet or exceed the following products:

- Wireless Receiver – DMP Model 1100X-W or 1100XH-W
- Wireless Repeater – DMP Model 1100R
- Universal transmitter – DMP Model 1101-W, 1102-W
- Universal Transmitter – DMP Model 1103-W
- Universal Transmitter – DMP Model 1105-W
- Wireless Window Transmitter – DMP Model 1107-W
- Wireless Zone Expander – DMP Model 1114-W
- Wireless Relay Output – DMP Model 1116-W
- Wireless LED Annunciator – DMP Model 1117R-B or 1117R-W
- Wireless Remote Indicator Light – DMP Model 1118R-B or 1118R-W
- Wireless Door Sounder – DMP Model 1119-W
- Motion Detector – DMP Model 1121-W, 1125-W, 1126R-W, 1126C-W, 1127W-W, and 1127C-W
- Glass Break Detector – DMP Model 1129-W
- Recessed Contact – DMP Model 1131-W
- Bill Trap – DMP Model 1139-I
- Panic Transmitter – DMP Model 1142-B, 1142-W, 1142BC-B, 1142BC-W
- Pendant Panic Transmitter – DMP Model 1145-1-B, 1145-2-B, and 1145-4-B
- Smoke Detector Transmitter – DMP Model 1161-W, 1162-W
- Wireless Smoke Detector – DMP Model 1165-W, 1165H-W, 1165HS-W
- Wireless Post Indicator Valve (PIV) – DMP Model 1181-R
- Wireless Outside Screw and Yoke Valve (OS & Y) – DMP Model 1182-R

- Wireless Heat Detectors 1183-135F and 1183-135R
- Wireless Carbon Monoxide Detector 1184-W

12.3 Power Supplies and Transformers

Power supply and transformer shall maintain system operation. The batteries shall be checked and replaced every three to five years. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:

- Power Supply – DMP Model 505-12, 115 VAC, 12 VDC
- Power Supply – DMP Model 505-12LX, 115 VAC, 12 VDC
- Power Supply – DMP Model 505-12L, 12 VDC
- Transformer - DMP Model 327, 16.5 VAC 50 VA, Plug-in
- Transformer - DMP Model 322, 16.5 VAC 56 VA, Wire-in
- Transformer - DMP Model 323, 16.5 VAC 56 VA, Wire-in
- Transformer – DMP Model 324, 16.5 VAC 100 VA, Wire-in
- Transformer – DMP Model 324P, 16.5 VAC 100 VA, Wire-in

12.4 Access Control Equipment

- Access control equipment shall provide access control functions between the panel and controller door access points. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:
- □ Interface Module – DMP Model 734, 734N, or 734N-WIFI Wiegand Interface Module
- □ Egress Module – DMP Model PB-2 REX Button
-
- □ Reader – DMP Model PP-6005B Proxpoint Plus©
- □ Reader – DMP Model MP-5365 Miniprox©
- □ Reader – DMP Model MX-5375 Maxi-Prox™
- □ Reader – DMP Model TL-5395 Thinline II™
- □ Door Controller – DMP Model 1306P Prox Patch™
- □ Door Controller – DMP Model 1306PW Prox Patch™
- □ Access Card – DMP Model 1351 ProxPass© Card
- □ Access Card – DMP Model 1326 Proxcard II© Card
- □ Access Device – DMP Model 1346 Proxkey II™ Keyfob, 1386 Isoprox II©
- 12.5 Cellular Communications Equipment
- Cellular Communications equipment shall plug directly into the XR150/XR350/XR550 PCB J24 connector and shall be supervised by the XR150/XR350/XR550 control panel. The Cellular Communications Equipment shall be of a low current draw and powered directly by the XR150/XR350/XR550 Control Communicator.
- The Cellular Communicator shall communicate in the SDLC Serial 3 Format for communications directly to a SCS-1R or SCS-VR DMP Central Station Receiver. The equipment shall have a three (3) year warranty as stated in the current DMP Product Catalog and meet or exceed features offered in the following products:
- □ 263H Digital HSPA+ Digital Cellular Communicator
- □ 263C CDMA Digital Cellular Communicator
- □ 380-400 Level 400 SIM Card (263H only)
- □ 381-2 18” Coax Cable
- □ 381-12 12’ Coax Extension
- □ 381-25 25’ Coax Extension
- □ 383 Rubber Duck Antenna
- □ 386 Wall Mount Antenna Bracket
- □ 387-1 3DB Fiberglass Antenna w/Bracket
- □ 387-3 3DB MEG Antenna
- □ 387-4 SMA to N Cable, 4ft
- □ 387-25 SMA to N Cable, 25ft

- □ 387-50 SMA to N Cable, 50ft
-
- 12.6 Z-Wave Wireless Devices
- The system shall be capable of 232 Z-Wave devices by means of the use of the model 738Z module. The following are compatible Z-Wave devices.
- □ 738Z Z-Wave Module
- □ Z-TZEMT400BB3X Z-Wave Thermostat
- □ Z-45602 Z-Wave Light Control Module with Dimmer
- □ Z-45603 Z-Wave Light Control and Appliance Module
- □ Z-99100-004 Z-Wave Door Deadbolt, Polished Brass
- □ Z-99100-005 Z-Wave Door Deadbolt, Satin Nickel
- □ Z-99100-006 Z-Wave Door Deadbolt, Venetian Bronze

13.0 INSTALLATION

13.1 System Component Installation

Materials shall be installed in strict compliance with all local, state, county, province, district, federal and other applicable building, safety, and fire standards, laws, codes, regulations, and guidelines including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ).

14.0 EQUIPMENT:

Provide the following equipment.

XR550N DMP SECURITY PANEL

- 32 individual reporting areas, with common areas
- Up to 16 supervised door access-points and/or keypads
- Fully supervised 10/100 network and 3G/4G cellular communication
- Communications Diagnostics check network and cellular communication status from the keypad.
- 128 Bit AES (Advanced Encryption Standard) Encryption
- Flexible system arming features, with Instant Arming option
- Card plus pin and temporary codes
- Lock Down operation from keypad or remotely
- 10,000 user codes with 99 profiles
- 506 Outputs
- 12,000 event buffer
- 1.5 Amps 12 VDC smoke and auxiliary output with OVC protection
- Two Man Rule, Panic Button Test and Early Morning Ambush

7073 DMP KEYPAD / PROXIMITY READER

- Codeless arming and disarming
- On‑board DMP proximity reader that allows users to simply present their proximity credentials to the keypad to gain access to a protected area.
- Momentary bypass to provide an entry and exit window on systems with 24-hour perimeter protection, DMP offers the momentary bypass feature.

DMP ZONE EXPANSION MODULES

- Provides Class B zones for burglary and fire
- Compatible with DMP Panels that allow zone expansion
- Suitable for mounting near protection devices
- Connect devices using 4-wire bus

- Compatible with all panel zone types
- Easy connection to 4-wire Keypad or LX-Bus™
- Proven design ensures stability and performance
- Data LED on zone expander indicates good panel communication
- Durable and attractive plastic or metal housing
- Low current draw
- Can be powered from panel or auxiliary power supply

505 SERIES DMP POWER SUPPLY

- Regulated and filtered power system
- Power-indicating LEDs
- Built-in overload protection
- Battery backup/charging circuit ,5 Amp output , 12 VDC power supplies
- Battery cutoff to prevent deep discharge of batteries

C100STE SERIES NAPCO DUAL MOTION DETECTOR

- Broad range and wide angle coverage suitable for most residential & commercial installations worldwide
- Patented Adaptive® technology continuously monitors and dynamically self-adjusts the sensor to its environment.
- Smart microprocessor-based false alarm discrimination.
- Dual technology microwave and PIR signal verification.
- Optimized field-of-view with custom-engineered aspheric optics.
- Tamper/Vandalism Supervision.
- Added False Alarm Prevention Features.
- Microprocessor: 2K ROM with A-D Converter
- Self-Test Interval: 11 - 16 hrs. •
- Power supply requirements: Filtered 10.6 to 16VDC nominal with battery backup form the control panel.
- Current drain: 28mA (idle/alarm) at 12VDC (nominal)

SD-70/SD-80 TANE ALARM PRODUCT RECESSED CONTACT

- (Steel Door) – New Stubby Style with 1 ½” Gap
- Rugged one piece construction
- Sensitive "No stick" UL rhodium reed
- Long leads bent to keep solder off the glass of the reed
- Two Solder points on 22 AWG 7 stranded UL Wire
- Thick plastic shell to prevent crushing
- 12" leads std. Longer leads available

1386/10 HID ISOPROXII CARD (10 PKG)
 ISOProx II is extremely thin, durable, and the size of a credit card. Passive, no-battery design allows an infinite number of reads. Provided blank for customization or badging applications

1346/100 HID PROXKEY III ACCESS DEVICE (1 set of 100)
 Impact resistant construction, standard key size, and consistent read capability make the HID ProxKey III an ideal choice for an unobtrusive access device. Can be installed on key ring for convenience.

1100XH DMP 1100 Series WIRELESS HIGH POWER RECEIVER (1 each)

 Receivers allow you to add wireless transmitters to DMP panels as easily as adding a keypad.
 Supporting up to 500 wireless transmitters

1100R DMP 1100 Series WIRELESS REPEATER (5 each)
 Extend the communication range of DMP wireless devices with the 1100R Wireless Repeater. Refer to plan for location.
 Use up to eight 1100R repeaters with any DMP 1100 Series Receiver system.
 The plug-in DC power supply is backed up by a 24-hour battery.
 On-board LEDs provide built-in survey capability to enable single-person installation and eliminating the requirement for an external survey kit.
 An internal case tamper switch provides device security.

1145-4-B DMP KEY FOB TRANSMITTER (2 each)
 The Key Fob transmitters are portable, water resistant, and designed to be clipped to a keychain or lanyard.
 The key fob LED provides visual acknowledgement when a button is pressed and responds to each separate operation with specific color-coded LED status displays.

1142BC DMP TWO-BUTTON HOLD-UP TRANSMITTER (4 each)
 The Two-Button Hold-up transmitters are typically used as a panic alarm, but with a little imagination this transmitter can be used for a multitude of applications

41021452616 ATW THE DOBERMAN SIREN & STROBE COMBINATION – INTERLOCK WITH DMP.
 Indoor/Outdoor Siren & Strobe Combination
 Strobe can be independently wired from siren Single tone piezo siren – warble Strobe flashes at same rate as siren
 Operating voltage: 6 - 14 VDC, Sound output: 105 dB @ 12 VDC
 Current draw: 180 mA @ 12 VDC; 90 mA at 12 VDC strobe only
 Dimensions: 2.9” x 4.8” x 1.7”
 Color: Ivory body with blue strobe
 Material: UV-resistant, high impact polycarbonate plastic
 Wiring: Red-positive (strobe & siren); White-positive (strobe only); Brown-common

NOTE:
 All door contacts needs to be program for both security and door annunciation
 The WiFi system and panic transmitters needs to be program as a panic system as provided by the security panel.
 The siren & strobe combination needs to be program (strobe only) to be activated by the panic system. They needs to be powered by power supplies throughout, to be install in the IDF’s or MDF, wiring to be 18/2.
 Programming of zones for the security system needs to be clarified by Special System staff for example, kitchen, LRC, office and athletic needs to be in separate zones.
 Programming of all the special systems needs to be approved prior to final configuration.
 Vendor must program the proxies as requested by the district.

END OF SECTION

SECTION 17300 - TECHNICAL CABLING SYSTEM SPECIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Summary of Work:
   a. Provide a complete and tested cable distribution system for data interconnections. The data distribution system shall include fully terminated unshielded twisted pair cables, raceways, conduit, UTP termination devices, data communications outlets, patch panels, patch cables, and another incidental and miscellaneous premises wiring system hardware as required for a complete and usable system. The installation shall comply with all applicable codes and standards in effect at the job site and as indicated in the Drawings and Specifications.
   b. Contractor shall provide new Fiber Optic armored plenum cable from MDF to each IDF.

1.2 QUALITY ASSURANCE

A. Acceptable manufacturers:
   a. The equipment/products described herein, and furnished per these specifications shall be the product of one manufacturer. No substitutions allowed. All references to model numbers and other detailed descriptive data are intended to establish standards of design performance, and quality, as required.

B. Installer Qualifications:
   a. The Data Cable System Installer shall be licensed and shall meet all applicable regulations of the State of Texas and Department of Labor insofar as they apply to this type of system. The proposer shall be firm normally employed in the low voltage and data cabling industry and shall provide a reference list of five (5) large-scale projections and contact names confirming successful category 6 premises wiring system installations.
   b. All Data Cable systems installation shall be performed by a (BICSI) Certified-Registered Telecommunications Technician or under the direct supervision of a (BICSI) Certified-Registered Communications Distribution Designer (RCDD).
   c. All data Cable Systems installation shall be performed by a factory/manufacturer certified installer, no exceptions.

C. Pre-Construction Meeting:
   a. The successful Contractor shall attend mandatory pre-construction meeting with individuals deemed necessary by the Owner’s representative prior to the start of the work,

D. Acceptance:
   a. The owner’s representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

E. Warranty:
   a. The selected system installer shall be a certified installing Contractor of product and hold current certification. Contractor shall be shall provide and end-to-end performance warranty of not less than five (5) years on all products installed. The proposer shall provide current certification documentation. The performance warranty shall be issued by tested bi-directly (end to end) using Level 2 tester, per TSB-67, and that all test results conform to the most current TIA/EIA-526-14 Standard, method B.
   b. The warranty will also cover multimode fiber optic cabling. Performance testing shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, method B.

c. The warranty will stipulate that all products used in this installation met the prescribed mechanical and transmission specifications for such products as described in ISO/IEC 11801, ANSI/TIA/EIA-568-A or EN 50173. Quality and workmanship evaluation shall be solely by the owner/designer and designated representatives.

1.3 REGULATORY REQUIREMENTS

A. Standards: All work shall be performed in accordance with the latest revisions of the following standards and codes:
   a. Latest Local and Codes and Amendments
   b. 2011 National Electrical Code

B. Other References:
   a. TIA/EIA-568-A Commercial Building Telecommunications Wiring Standard
   b. EIA/TIA-569 Commercial Building Standard for Telecommunication Pathways and Spaces.
   c. TIA/EIA-606 The administration Standard for the Telecommunications Infrastructure of Commercial Buildings
   d. TIA/EIA-607 Commercial building Grounding and Bonding requirements for telecommunications.
   e. EIA/TIA4 455-A Standard Test Procedure for fiber optic fibers, Cables, transducers, sensors, connecting and terminating devices and other fiber optic components.
   f. TIA/EIA TSB 67 Transmission Performance Specification for Field Testing of Unshielded Twisted-Pair Cabling systems
   g. TIA/EIA TSB 72 Centralized Optical Fiber Cabling Guidelines
   h. ISO/IEC 11801 Generic Cabling Standard
   i. EN 50173 Generic Cabling Standards for Customer Premises
   j. ANSI/EIA/TIA 526-14Optical power loss measurements of Installed Multimode Fiber Cable Plan

C. Governing Codes and Conflicts:
   a. If the requirements of these specifications or the project Drawings exceed those of governing codes and regulations, then the requirements of these specifications and the drawings shall govern. However, nothing in the drawings or specifications shall be construed to permit work not conforming to all governing codes and regulations

1.4 ABBREVIATIONS

a. The following abbreviations are used in this document:

CMP	Ceiling Mounted Projector
TWS	Teacher Workstation
PS	Presentation Station
UTP	Unshielded Twisted Pair
STP	Shielded Twisted Pair

1.6 SUBMITTALS

A. Project Initiation:
   a. Within fourteen (14) days of Notice to Proceed, the projection system installed shall furnish the following in a single consolidated submittal:
      i. Permits: the Contractor shall obtain all required permits and proved copies to the Owner/Architect/Engineer.
      ii. Product literature: Complete manufacture’s product literature for all projectors, mounting plates, projector bracket, speakers, amplifiers, Cable, cross-connect blocks, Cable supports, Cable labels,

outlet devices, and other products to be used in the installation. In addition, whenever substitutions for recommended products are made, samples (when requested by the Owner/Designer) and the manufacturer's supporting documentation demonstrating compatibility with other related products shall be included.

iii. Construction Schedule: a time-scaled construction schedule, using the installation of the Cable distribution system.

iv. Testing: Proposed Contractor Enhanced Category 6 UTP Cable test result forms, fiber optic Cable test result forms and a list of instrumentation to be used for system testing.

B. Shop Drawings:

a. Submit the following items, for Owner review and approval, within twenty-eight (28) days of notice to proceed.

i. Proposed circuit routing and circuit grouping plan prepared by a BICSI certified RCDD (registered Communications Distribution Designer). The RCDD certification must be current.

ii. Conformance: For items which are being provided exactly as specified, provide a letter stating the item description and model number, and that it is being provided as specified. For items which are not as specified, provide standard manufacture's cut sheets or other descriptive information and a written description detailing the reason for the substitution.

C. Project Completion:

a. As a condition for project acceptance, the Contractor shall submit the following for review and approval:

i. Samples: Complete manufacture's product literature and samples (if requested) for all pre-approved substitutions to the recommended products made during the course of the project.

ii. Inspection and test reports: During the course of the project, the Contactor shall maintain an adequate inspection system to unsure that the materials supplied and the work performed conform to Contact requirements. The Contractor shall provide written documentation that indicated that materials acceptance testing was conducted as specified. The Contractor shall also provide documentation which indicated that all Cable termination testing was completed and that all irregularities were corrected prior to job completion.

iii. Operating and Maintenance instructions: Operating and maintenance instruction for all devices within the system. This instruction shall reflect any changes made during the course of construction, and shall be provided to the Owner for their use in a three-ring binder labeled with the project name and description (4 Copies).

iv. As Built Drawing: As built drawings will include Cable pathways, outlet locations with correct labeling and MDF location. The as-built drawings will be prepared using AutoCAD version 14 or later. Provide the owner with one Mylar plot of each drawing and two blue line prints of each drawing. Provide the Owner with electronic versions of the as-built on 3-1/2" diskettes or CD Rom.

PART 2- PRODUCTS

2.1 GENERAL

A. Installation: The cabling shall be installed per requirements of the manufacturer and the Project Documents utilizing materials eating all applicable TIA/EIA standards. The Contractor is responsible for providing all incidental and/or miscellaneous hardware not explicitly specified below as required for a complete and operational system.

B. Materials: Materials shall be as listed or shall be approved equivalent products of other manufacturers meeting the intent and quality level of the TIA/EIA specifications. All approved equivalent products will be published by addendum ten days prior to proposal for Architect/Engineer to review.

C. Testing: all installed cabling shall be tested 100% good after installation by the Contractor.

D. Ratings: all products shall be new and brought to the job site in the original manufacturer's packaging. Electrical components (including inner duct) shall bear the Underwriters Laboratories label. All communications Cable shall bear flammability testing ratings as follows:
   a. CM Communications Cable
   b. CMP Plenum Rated Communications Cable
   c. CMR Riser-Rated Communications Cable

E. Initial Cable Inspection: The Contractor shall inspect all Cable prior to installation to verify that it is identified properly on the reel identification label, that it is of the proper gauge, containing the correct number of pairs, etc. Note any buckling of the jacket that would indicate possible problems. Damaged Cable or any other components failing to meet specifications shall not be used in the installation's

F. Cable Lubricants" Lubricants specifically designed for installing communications Cable may be used to reduce pulling tension as necessary when pulling Cable into conduit.
   a. Approved Products
      i. Twisted-pair Cable: Dyna-Blue
         American Polywater

G. Fire Wall Sealant: Any penetration through firewalls (including those in sleeves) will be released with an Underwriter Laboratories (UL) approved sealant.
   a. Approved Products
      i. 3M or
      ii. Pre-approved equal

2.2 NEW MISSION CISD - DATA CLOSET (MDF/IDF) ENHANCED FIBER AND CATERGORY 6 TERMINATION HARDWARE

A. Equipment: Provide the following equipment each room.

IDF ROOM

Product	Description	Quantity
WS-C3850-48F-S	Cisco Catalyst 3850 48 Port Full PoE IP Base	3
CON-SW-WSC388FS	CISCO BASE Cisco Catalyst 3850 48 Port Full PoE IP	3
EXTREME NETWORKS	Summit X460-G2-48x-10GE4, 48-port-GbE model(CAMERAS)	3
EXTREME NETWORKS	Summit X440-48t(CAMERAS)	3
PWR-C1-1100WAC	1100W AC Config 1 Power Supply	3
CAB-TA-NA-RA	United States AC Right Angled Power Cable	3
C3850-NM-2-10G	Cisco Catalyst 3850 2 x 10GE Network Module	3
S3850UK9-33SE	CAT3850 Universal k9 image	3
STACK-T1-50CM	50CM Type 1 Stacking Cable	3

CAB-SPWR-30CM	Catalyst 3750X Stack Power Cable 30 CM	3
SFP-10G-LRM=	10GBASE-LRM SFP Module	2

7 ft Racks Specifications Qty	Model	Description
1	ACF126 or Equivalent	Rack Air Removal Unit SX Ducting Kit for 24" Ceiling Tiles
1	ACF402 or Equivalent	Rack Air Removal Unit SX 100-240V 50/60HZ for NetShelter 750mm enclosures.
1	AR3140 with cable management or Equivalent	NetShelter SX 42U 750mm Wide x 1070mm Deep Networking Enclosure with Sides
1	SUM3000RMXL2U or Equivalent	APC Smart-UPS XL Modular 3000VA 120V Rackmount/Tower
2	SUM48RMXLBP2U or Equivalent	APC Smart-UPS XL Modular 48V Extended Run Battery Pack

Note: Contractor shall verify quantities with the plan and provide the higher number of devices.

B. Distribution Rack Grounding
   a. All racks shall be grounded using stranded #6 AWG insulated copper conductor. Connect to service entrance grounding electrode. Provide all required bonding materials and hardware and bond to building grounding electrode subsystem at building at building electrical service entrance.
      i. Approved products- Ground Terminal Block
      Chatsworth Products, Inc.- (CPI) #08009-001
      ii. Approved Products- Wall mount Bus Bar (one pre MDF/IDF location)
      Chatsworth Products, Inc (CPI) #10622-010

C. Fiber optic Equipment:

Fiber Optic Cable – Back Bone between closets
Each telecommunication closet shall have a fiber run of 12 fiber enhanced 10 Gig 50/125 TIA/EIA-568-B-3.1(ISO 11801 OM3) for 500 meters. Indoor/Outdoor Innerlocking Armour plenum cable Manufactured by Systimax # P-012-OZ-5K-FSUBK. If a connection between buildings is required an Outside Plant cable must be used. The armor color shall be Aqua.

Fiber-optic cable:

1. Minimum of 12 strand 50/125 or micron fiber-optic cable
2. All Fiber-optic cable will be installed to meet EIA/TIA specifications to support 10GB.
3. All Fiber-optic cable strands will be tested with Optical meter for maximum DB loss

All testing and certification results are to be compiled in a table by location, cable number and strand or color and provided with “as-built” drawings

Fiber Optic Connecting Hardware
Systimax fiber optic patch cord matching the fiber optic run will be supplied for each fiber connection. Each 2 fibers in the system will have a fiber patch cord supplied with it. A fiber optic patch cord must be tested and labeled according to TIA/EIA Standards. Part numbers for patch cord are as follows:

LC/LC Multimode Duplex Patch Cord –

- LazrSPEED® 550 LC to LC, Fiber Patch Cord, 1.6 mm Duplex, Riser (FEXLCLC42-MXF007)

Contractor will supply fiber optic hardware to match the fiber cable being installed that is listed below:

LC 10 Gig Multimode Opti-Cam Connector

- LazrSPEED® Fiber Qwik II-LC Connector™, field installable, aqua (MFC-LCF-09-5X)

D. Rack Mount Enclosure

- Ready™ 1U Internal Sliding Shelf, black (RFE-SLC-IS-EMT-BK/1U-PNL)
- Ready™ 4U Internal Sliding Shelf, black (RFE-SLC-IS-EMT-BK/4U-PNL)
- LazrSPEED® LC, 12 Fiber, Ganged Aqua Adapter, Black Panel, Single Pack (PNL-BK-012-MFA-LC12-AQ)
- MDF/IDF's
- One fiber patch cable on the MDF or IDF is to be supplied per port
- Rack Mount Enclosure at MDF will use one or multiple FRME4 to support all IDF fiber connections.
- Contractor is responsible for terminating any phone cables to new racks.
- Network Hardware list will require the mounting of racks and UPSs. All racks must be grounded according to industry standards.

E. Category 6 equipment:

Category 6 Cable –
Each Work Area Outlet shall consist of Systimax Uniprise Category 6 Plenum cables from designated MDF or IDF to each area; number of cables described in accompanying documentation.

- UltraMedia® 7504 ETL Verified Category 6e U/UTP Cable, plenum, yellow jacket. (7504 YELLOW CPK)
- 3 meters service loop to be provided at each termination including MDF/IDF's.

Unshielded Twisted Pair (UTP) Category 6 cable:

1. All Category 6 cable will be tested with certified level tester that can provide a hard copy. Level 6 cables will be tested for according to industry standards.
2. Vendor will provide hard copy of test results for all ports.
3. Cable will be Category 6 4-pair plenum.
4. Installation should follow the UTP Category 6 standards for distance
5. All termination jacks, connectors, and patch cords will follow Category 6 UTP standards or higher.
6. All wall faceplates and cables will be labeled in a scheme where switch ports can be identified.
7. Cable must be labeled on both end with gap between label and cable end of 6 inches.
8. Installation must meet or exceed all ANSI/TIA/EIA-568-B.2-1 for Category 6 cabling.
9. Each equipment rack or wiring closet shall have adequate horizontal and vertical wire management hardware to ensure an organized and aesthetic installation to the District's satisfaction.
10. All jacks and patch panels shall be configured to the 568B-wiring scheme.

All wire mold systems and surface mounted boxes must be secured with anchors. Gluing to the wall as the sole means of securing these items is unacceptable. No less than one anchor must be installed for every three feet of wire mold. Copper

(UTP) runs in classrooms and offices will be either in the walls (where possible) or in a minimum 1-1/2 inch wire mold when needed.

Category 6 Patch Panels
Adequate patch panel ports are to be supplied in MDFs and IDFs to accommodate the number of cable drops in this. All patch panels shall meet or exceed EIA/TIA Category 6 standards. Terminate and provide Category 6 Rj-45 jacks and wire management system. Label all patch panels with printed labels circuit ID. All jacks and patch panels shall be configured to the 568B-wiring scheme.

All Patch Panels must be of modular design.
Panels are to be 24 or 48 Ports only. 96 Port Panels will not be accepted.

- Uniprise® Category 6 Angled Patch Panel, 24 port (UNP610-ANG-24P)
- Uniprise® Category 6 Angled Patch Panel, 48 port (UNP610-ANG-48P)

Category 6 Accessories
Category 6 Inserts

- Uniprise UNJ600 Category 6 U/UTP Information Outlet, blue (Data) (UNJ600-BL)
- Uniprise UNJ600 Category 6 U/UTP Information Outlet, red Systimax Uniprise (Phones) (UNJ600-RD).

Standard Faceplate 4 ports –

- L Type Flush Mounted Faceplate, four port ivory (M14L-246)

Patch cables MDF/IDF's

- Use appropriate lengths to obtain a dressed appearance.

Classroom Patch Cables

- Uniprise Category 6 U/UTP Patch Cord, RJ45 to RJ45, 4-pair, Non-Plenum, Yellow Jacket 14-15 Feet (UNC6-YL-15FT).

F. Raceway/Wire Molding

1. All wire mold systems and surface mounted boxes must be secured with anchors. Gluing to the wall as the sole means of securing these items is unacceptable. No less than one anchor must be installed for every three feet of wire mold. Copper (UTP) runs in classrooms and offices will be either in the walls (where possible) or in a minimum 1 inch wire mold when needed.

2. All patch cords, cable, jacks, patch panels and any other device used in the cabling system must be labeled.

3. Cable drops included in this proposal will be used to support voice in each classroom, office, and resource rooms. Vendor must separate voice drops to different patch panel's base on the layout provided on this appendix. Typically every room will have at least one voice drop. Areas such as offices and conference may have more than one drop. Locations of voice drop will be determined by vendor and Mission CISD at a later time.

G. Cable tray:

Cables trays shall be rated according to EIA/TIA for the environment in which they are to be placed and adhere to all the Standards. Cable trays will have at a minimum one-inch wide support stingers spaced at twelve inches and four inches deep. Cable trays shall be securely fastened to the building structure. If threaded rod is used to support cable tray, smooth rigid tubing must be used to cover the threaded rod at a minimum of twelve inches above the cable tray. J hook type cable supports shall be securely fastened to the building structure and be spaced at a minimum distance of five (5) feet. J hooks shall be sized as follows: two inch J hooks are rated for 75 cables and will be used to support cable paths of 50 or less cables, four inch J hooks are rated for 150 cables and will be used to support cable paths of 51 to 100 cables, CAT425 cloth wrap fasteners are

rated for 425 cables and will be used to support bundles of 101 or more cables. All cable paths shall be sized with 20% spare capacity. All attachment hardware must be approved for the type of installation and maximum load rating of the products to be installed. Vendor is responsible for installing all pathway structures for these projects.

Ladder racks (IDFs, MDFs) will connect to the pathway structures.

All penetrations through walls and floors shall be sleeved. All sleeves shall have permanently attached. Sleeves shall be sized to accept 50% growth. All sleeves shall be fire-stopped using UL® approved methods and shall return fire-rated structures to the original fire rating. All sleeves between floors shall be supported with a conduit riser clamp installed per the manufacturer direction and shall be installed tight to the ceiling with enough sleeve to attach the bushing and rise up three inches above the floor on the opposite end.

2.4 STATION WIRING

A. Wire: the data and voice wire provided for all outlets shall be Category 6 unshielded twisted pair, four-pair, 23 AWG solid cooper conductor, meeting the intent and quality level of the TIA/EIA-568-A Commercial building wiring standard. Refer to floor plan and data outlet legend for number of active data products to specified faceplates.

B. Testing: The Enhanced Category 6 four-pair UTP Cable must be UL performance level tested. Each 1000 foot spool must be individually tested with test results affixed to the spool.

C. Rating: Cable installed in conduit shall be non-plenum rated. Cable not installed in conduit shall be plenum rated if installed in plenum ceiling spaces, non plenum rated otherwise.

2.5 STATION HARDWARE

A. Flush Mount Jacks: Flush mount jacks shall be high quality Category 6 RJ45 modular jacks with circuit board construction and IDC style or 110 style wire, T568B terminations. Jacks shall meet EIA/TIA TSB40 recommendations for category 6 connecting hardware.

B. Workstation Patch Cables: Cabling Contactor shall provide owner with (1) 12’ Category 6 patch Cable for each data drop on entire project. Each Cable will be terminated properly with RJ45 connections on each end with appropriate pin-out assignments per project configuration. Coordinate with owner on length of cable prior to commencing any work.

PART 3- EXECUTION

3.1 GENERAL

A. Fire wall penetrations: the Contractor shall avoid penetration of fire-rated walls and floors whenever possible. Where penetrations are necessary, they shall be sleeved with metallic conduit and resealed with an Underwriter Laboratories (UL) approved sealant. Contractor shall also seal all floor, ceiling and wall penetrations in fire or smoke barriers and in the wiring closet.

B. Allowable Cable Bend Radius and Pull tension: In general, communications Cable cannot tolerate sharp bends or excessive pull tension during installation. Refer to the Cable manufacturers allowable bend radius and pull tension data for the maximum allowable limits.

C. Cable Lubricants: After installation, exposed Cable and other surfaces must be cleaned free of lubricant residue.

D. Pull strings: Provide pull strings in all new conduits, including all conduits with Cable installed as part of this contract. Pull test is not to exceed 200 pounds. Data and video Cables can be pulled together with pull strings

E. Conduit Fill: Conduit fill shall not exceed 40%

F. Damage:

a. The Contractor shall replace or rework Cables showing evidence of improper handling including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals and Cable sheath removed too far (over 1-1/2 inches).
b. The Contractor shall replace any damaged ceiling tiles that broken during installation.

G. Clean up:
a. All clean up activity related to work performed will be the responsibility of the Contractor and must be completed daily before leaving the facility.

3.2 DOCUMENTATION

A. Labels:
a. The Contractor will label all outlets using permanent/legible typed or machine engraved labels approved by the Owner (no handwritten labels permitted). Label patch panels in the wiring closet to match those on the corresponding data outlets. The font shall be at least on-eight inch (1/8") in height, block. All labels shall correspond to as-builts and to final test reports.
b. The following nomenclature should be used when labeling data/voice jacks:
c. All Cables being served by MDF closet shall begin with "MDF" all IDF served Cables shall begin with "IDF-#" (# designated IDF closet number).
d. Next identification letter shall refer to patch panel that is serving outlet (A, B, C…)
e. Next identification shall note what # data port on patch panel (1 thru 48).
f. Example:
i. Outlet from 23rd port of the third patch panel from top of rack located at IDF-2
1. I2-C23
ii. Outlet from the 5th port of the second patch panel from the top of rack located at MDF
1. M-B5

B. Floor Plan
a. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.

C. Cables: All Cables shall be labeled at both ends. This includes but not limited to horizontal voice and data cabling, copper backbone tie Cables, and fiber optic Cables.

D. Fiber optics: Fiber optic strands shall be labeled at both ends on the fiber distribution panel.

E. Equipment racks: Equipment racks shall bear at least one indicating label indicated MDF or IDF. If rack is installed in IDF, label shall include IDF #.

3.3 EQUIPMENT RACK CONFIGURATION

A. Equipment Racks: Equipment racks shall be assembled and mounted in locations shown on the Drawings and as detailed. Each Rack shall be securely mounted on the floor and braced to the wall with Cable tray in accordance with the manufacturer's instructions and recommendations. Racks shall be mounted such that the side rails are plumb with vertical Cable management panels. Racks to be located such that future expansion can occur without relocating existing racks. Racks shall be grounded in accordance with NEC requirements.

B. Wire management Components: Horizontal Cable management panels shall be installed directly above and below each patch panel, also 2 per each 48 port patch panel should be left at site to accommodate the switch gear when they are installed. Vertical Cable management panels shall be installed in each side of the rack. In instances where more than one rack is installed in a single location, vertical Cable management shall be installed between the racks and on either side.

C. Cable Placement: Cable installation in the wiring closet must conform to the project drawings, all cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance location. Avoid crossing area horizontally just above or below any riser conduit. Lay and dress Cables to allow other Cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.

D. Cable Routing: Cable shall be routed as close as possible to the ceiling, floor or corners to ensure that adequate wall or backboard space is available for current and future equipment. All Cable runs within the wiring closet shall be

horizontal or vertical within the constraints of minimum Cable bending raii. Minimum bend radius shall be observed. Cables shall not be tie-wrapped to electrical conduit or other equipment.

E. Installation: all incoming Cables shall be routed on the Cable tray and neatly dressed down to the patch panels.

F. Hardware: provide rack and jack panel hardware as required for all data station wiring.

3.4 STATION WIRING INSTALLATION

A. General:
   a. Cabling between wiring closet and workstation locations shall be made as individual home runs. No intermediate punch down blocks or splices may be installed or utilized between the wiring closet and the communications outlet at the workstation location.
   b. All Cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the Cable. There shall never be more than one and one half inches of unsheathed enhanced category 6 UTP Cable at either the wiring closer or

B. Exposed Cable:
   a. All cabling shall be installed inside walls or ceiling spaces whenever possible. Exposed station Cable will only be run where indicated on the Drawings.
   b. Unless otherwise approved all cabling shall be concealed. All cabling ran in exposed ceiling areas shall be routed in conduit adequately sized and shall maintain fill ration per NEC and BICSI standards.

C. Placement: All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair the Owner’s efficient use of their full capacity.

D. Cable Routes:
   a. All cabling placed in ceiling areas must be in conduit, Cable tray or J-Hookes. Cable supports shall be permanently anchored to building structure or substrates. Provide attachments hardware and anchors designed for the structure to which attached and that are suitably sized to carry the weight of the Cables to be supported. Do not route Cable through webbing of structural steel. Cabling must be supported in dedicated supports intended to support cabling as described in this section.
   b. Attaching Cable to pipes or other mechanical items is not permitted. Use J-Hooks for up to 15 Cables (Chatsworth hooks with appropriate brackets). All runs of sixteen (16) or more Cables provide Cable rings on 36 inch maximum centers to hang Cable. Communications Cable shall be rerouted so as to provide a minimum of 18 inches spacing shall not be attached to ceiling. Grid support wires. Cable runs shall be parallel or perpendicular to building structure. Multiple Cables to be bundled together every 6 feet.

3.4 STATION HARDWARE

A. Flush Mount Jacks: Flush mount jacks shall be mounted in a faceplate with back box.

B. Placement: Where possible, the PS outlet shall be located so that its centerline is 18 inches above floor level or 12 inches above permanent bench surfaces. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches. The CMP outlet shall be installed in the ceiling mounted projector plate.

C. RJ-45 Jack Pin Assignments:
   a. Pin connections for data station Cable outlets and patch panels shall match EIA/TIA 568 modular jack wiring recommendation T568B.
   b. Pin Connections at data jack panels shall match pin connections at outlets (straight through wiring).

3.5 CABLE TESTING REQUIREMENTS

A. Notification: The Owner shall be notified one week prior to any testing so that the testing may be witnessed.

B. Inspection: Before requesting a final inspection, the Contractor shall perform a series of end-to –end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms and timetable for all copper and fiber optic cabling.

C. Procedures: Trained personnel shall perform all testing. Acceptance of the test procedures discussed below is predicated on the Contractor's use of the recommended products and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.

D. Errors: when errors are found, the source of each shall be determined, corrected and the Cable retested. All defective components shall be replaced and retested. Re-test results must be provided on Owner approved forms and witnessed by Owner.

E. Twisted Pair Cable Testing:

a. At a minimum, the Contractor shall test all station drop Cable pairs from Data Closet termination patch panels to outlet device RJ45 jacks. Enhanced category 6 products shall be tested for compliance to ANSI/TIA/EIA 568A and ISO/IEs 11801 for Enhanced Category 6 rated installation. Test equipment used shall meet TIA/EIA TSB-67, Level II accuracy. Further, the Contractor shall have a copy of TSB-67 in their possession and be familiar with its contents.

b. Each wire/pair shall be tested at both ends for the following:

i. Wire map (pin to pin connectivity)
ii. Length (in feet)
iii. Attenuation
iv. Near end cross talk (NEXT)
v. Power Sum

c. Test equipment shall provide an electronic and printed record of these tests

d. Test results for each Enhanced Category ^6 four pair UTO Cable must be submitted with identification to match labels on all patch panel ports and RJ45jacks and must match as-builts associated with that Cable.

e. All testing of Category 6 twisted pair Cable testing shall be performed as described above and comply with all current Category 6 testing parameters and standards.

f. All testing of Category 6 twisted pair Cable testing shall be preformed as described above and comply with all current Category 6 testing parameters and standards.

F. Testing: Once installed the cabling will be tested for continuity, shorts and grounds.

a. Cabling:

i. Continuity-100 % continuity testing is required and will be tested from the MDF/IDF location to each classroom drop. A checklist of each Cable and test performed on that Cable will be submitted once the testing has been completed.
ii. Shorts- No Cable shorts will be permitted on the system. If a short is detected, the connector or Cable will be repaired or replaced.
iii. Grounds – no direct ground on the center conductor of the AVDN Cables are permitted.

b. System:

i. Continuity- as tested in the above testing requirements.
ii. Power readings- a power reading will be required at each drop of each of the cabling systems. A +3 dB to a +7 dB is required at each drop with a common feed signal of +15 dB into the head end amplifier. These measurements to be taken with an approved field strength meter of know calibration. These measurements to be performed at low channel, mid-band channel; and high channel to determine Cable slope.
iii. Signal Quality- a standard receiver, typical of those used in the system, shall randomly be connected to 10% of the outlets across the system and tuned to a reference channel of known quality. No visible indication of co-channel interference, noise, ghosting, or beat interference may be observed.

iv. Carrier to Noise- Carrier to Noise shall be measured at random outlets representing an average cross section of the drops with an approved field strength meter by the following process. With normal operating levels the field set shall be tuned to each channels visual carrier and the level recorded. The input signal to the head end amplifier shall be removed and the input of the amplifier terminated with a short. Each channel shall be re-measured and the noise levels recorded. The carrier to Noise measurement is the difference of the two figures.

v. Documentation of Results- all recorded measurements are to be tabulated and included in the system documentation manual for reference during maintenance of the system.

3.6 INSPECTION

A. General: Conformance to the installation practices covered above is to be verified when completed. In some cases, the Owner/Designer may inspect before acceptance.

END OF SECTION

SECTION 17400 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data on features, ratings, and performance.

B. Shop Drawings: For VIDEO SURVEILLANCE equipment. Include plans, elevations, sections, details, and attachments to other Work.

1. Design Calculations: Calculate requirements and perform structural analysis for installed products including selection of seismic restraints, signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include dimensioned plan and elevation views of components and enclosures, and details of control panels. Show access and workspace requirements.
3. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Coordination Drawings: Plans drawn to scale and coordinating locations of VIDEO SURVEILLANCE equipment. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Location of items requiring installation coordination including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and other architectural features.

D. Product Certificates: Signed by manufacturers of VIDEO SURVEILLANCE equipment and components certifying that products furnished comply with requirements.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements of installed systems.

G. Maintenance Data: For television equipment and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:

1. Detailed operating instructions covering operation under both normal and abnormal conditions.
2. Routine maintenance requirements for system components.
3. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

H. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the VIDEO SURVEILLANCE equipment manufacturer, for both installation and maintenance of units required for this Project, to supervise installation of the system. Contractor shall be certified to install equipment specified. Proof of certification is required and shall be included in the submittal.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of television equipment and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

E. Comply with 47 CFR 15, 17, and 76.

F. The installer shall have an office within 50 miles of the job site staffed with trained technicians who are qualified to manage the installation, to be responsible that the system is installed as submitted, to conduct system start-up, to instruct the project coordinators representatives and local authorities in the proper operation of the system, and to provide service throughout the warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (No substitutions)

A. Provide the following equipment. Note: Refer to plans for quantities. Include all cost for a complete operable system.

A. Materials - VIDEO SURVEILLANCE IP Camera.(REFER TO PLAN)

1. MFR. ARECONT #AV5225PMIR – AV-EBA(BOX ADAPTER PLATE)
2. MFR. ARECONT # AV3556DN-F – MCD-CMT(PENDANT MOUNT)
3. MFR. ARECONT # AV2556DN-F – MCD-WMT(WALL MOUNT)
4. MFR. ARECONT # AV1555DN-F – MCD-4S (SURFACE MOUNT)

XPCODL Milestone XProtect Corporate Camera Device License (35 each)

- To connect to a camera, a license per camera channel is required. In total, for all copies of the product installed under this license, the product may only be used with as many cameras as you have purchased camera licenses for.

Y2XPCODL Milestone XProtect Corporate Camera Device License (2 yrs PMA) (35 each)

- Two year XProtect corporate channel maintenance License

Accessories:
• SV-WMT - Indoor/Outdoor Wall Mount
• SV-CMT - Indoor/Outdoor Ceiling Mount
• SV-FMA - Indoor/Outdoor Flush Mount Adapter
• MD-PMA - Indoor/Outdoor Pole Mount Adapter
• MD-CRMA - Indoor/Outdoor Corner Mount Adapter
• MV-EBA - Indoor/Outdoor Electrical Box Adapter

A. Warranty

1. Minimum 2 Year parts and labor

2. Two year XProtect corporate channel maintenance

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cable. Check raceways, cables trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

3.2 INSTALLATION

A. Outdoor Installation: Comply with ANSI C2, "National Electrical Safety Code."

B. Provide data drop, category 6 cable to each camera from the switch located in IDF room. Cable by others as specified on specification 17300. No exposed cable.

C. Support and anchor masts, and mountings.

1. Concrete Foundations: Reinforced concrete complying with Division 3 Section "Cast-in-Place Concrete."
2. Steel Anchorage Components: Galvanized-steel shapes and plates complying with Division 5 Section "Structural Steel."

D. Wiring Method: Install cables in raceways, except in accessible indoor ceiling spaces and attics, in hollow gypsum board partitions, and as otherwise indicated. Conceal raceways and wiring except in unfinished spaces.

E. Wiring Method: Install cables concealed in accessible ceilings, walls, and floors where possible.

F. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Pulling Cable: Do not exceed manufacturer's recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

H. Exposed Cable: Install parallel to building lines, follow surface contours, and support the cable according to manufacturer's written instructions. Do not run adjacent and parallel to power or data cables.

I. Grounding: Provide independent signal circuit grounding recommended by manufacturer.

J. Install cameras at final locations defined by camera location tests. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

K. Install power supplies and other auxiliary components at control stations. Do not install such items near the devices they serve, unless otherwise indicated.

L. Install tamper switches arranged to detect unauthorized entry into system component enclosures and mount in self-protected, inconspicuous positions.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Basic Electrical Materials and Methods."

B. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and supervise pretesting, testing, and adjusting of new equipment. Coordinate with owner for final location prior to any work.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

C. VIDEO SURVEILLANCE Camera Location Test: Demonstrate proposed location with owner for approval. Adjust location per owners direction at no cost to contract..

3.5 CLEANING

A. Clean installed items using methods and materials recommended by manufacturer.

B. Clean VIDEO SURVEILLANCE system components, including camera-housing windows, lenses, and monitor screens.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain television equipment.

1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.
2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.
3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
4. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
5. Schedule training with Owner, through Architect, with at least seven days' advance notice.
6. Conduct a minimum of 2 hours' training as specified in instructions to Owner's employees in Division 1 Section "Contract Closeout."

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested by Owner within one year of date of Substantial Completion, provide on-site assistance in tuning and adjusting the system to suit actual occupied conditions and to optimize performance. Provide up to two adjustments at Project site for this purpose, without additional cost.

END OF SECTION