DEPARTMENT OF FINANCE AND PURCHASING

345 South Main Street

Harrisonburg, VA 22801

ISSUE DATE: April 1, 2014	**INVITATION TO BID NUMBER:** 2014043-CMO-B	**FOR:** New City Hall
DEPARTMENT: City Manager's Office	**DATE/TIME OF CLOSING:** May 1, 2014 at 2:00pm local time	**CONTRACT ADMINISTRATOR:** Mr. Ande Banks, Director of Special Projects

****A MANDATORY PRE-BID MEETING WILL BE HELD ON APRIL 18, 2014 AT 10:00AM****

Bids - In accordance with the following and in compliance with all terms and conditions, unless otherwise noted, the undersigned offers and agrees, if the bid is accepted, to furnish items or services for which prices are quoted, delivered or furnished to designated points within the time specified. It is understood and agreed that this entire ITB and any addendums shall constitute a contract.

NAME AND ADDRESS OF FIRM:

Telephone/Fax No.:

Federal Employer Identification # :

State Corporation Commission #:

E-mail:

By signing this bid, Vendor(s) certifies, acknowledges, understands, and agrees to be bound by the conditions set forth in this ITB.

CHECK ONE: ☐ **INDIVIDUAL** ☐ **PARTNERSHIP** ☐ **CORPORATION** ☐ **LLC**

Vendor's Legally Authorized Signature

Date

Print Name

Title

Sealed bids, subject to terms and conditions of this Invitation to Bid will be received by the City of Harrisonburg Purchasing Office, 345 South Main Street, Room 201, Harrisonburg, Virginia 22801 until the date/ time specified above for furnishing items or services delivered or furnished to specified destinations within the time specified or stipulated by the vendor(s).

The City does not discriminate against small and minority businesses or faith-based organizations.

**This document must be completed & returned with bid submission.*

P R O J E C T M A N U A L

for the :

New City Hall for the City of Harrisonburg

Harrisonburg, Virginia

MATHER ARCHITECTS, P.C.
373 Neff Ave.
Harrisonburg, Virginia 22801

BLACKWELL ENGINEERING
566 E. Market Street
Harrisonburg, VA. 22801

MEI ENGINEERING, INC.
276 S. Liberty Street
Harrisonburg, Va. 22801

ENGINEERING SOLUTIONS & CONSTRUCTION MANAGEMENT
1010 North Main Street,
Harrisonburg, Va. 22802

Project No. 013007

Date: March 31, 2014

SET NO.

TABLE OF CONTENTS

INVITATION TO BID

BID FORM

GENERAL CONTRACT FORMS

00100 General Conditions of the Contract For Construction (AIA Document A201)
00110 Supplemental Conditions of the Contract for Construction

DIVISION 1 – GENERAL REQUIREMENTS

01010 Summary of Work
01027 Applications For Payment
01040 Coordination
01050 Field Engineering
01200 Project Meetings
01210 Allowances and Unit prices
01300 Submittals
01400 Quality Control
01421 Reference Standards and Definitions
01500 Construction Facilities and Temporary Controls
01600 Materials and Equipment
01631 Substitutions
01700 Contract Closeout
01740 Warranties

CITY DOCUMENTS
Contractor Eligibility and Registration
State Corporation Commission Form
Non-Collusion Affidavit
General Terms and Conditions for the City of Harrisonburg, VA
Notice of Award
Notice to Proceed
Statement of Bidder Qualifications
Proprietary Information Identification

DIVISION 2 – SITE CONSTRUCTION
Refer to Civil Drawings

DIVISION 3 – CONCRETE

03300 Cast in Place Concrete
03410 Plant Precast Structural Concrete
03481 Glass Reinforced Concrete
03542 Cement-based Underlayment

DIVISION 4 – MASONRY

04720 Architectural Cast Stone
04810 Unit Masonry Assemblies
04860 Stone Veneer Assemblies

DIVISION 5 – METALS

05120 Structural Steel
05210 Steel Joists
05310 Steel Deck

05400 Cold-formed Metal Framing
05500 Metal Fabrications
05511 Metal Stairs
05720 Structural Glass Railing System
05730 Steel Fencing

DIVISION 6 – WOOD AND PLASTICS

06100 Rough Carpentry
06160 Sheathing
06176 Metal-Plate-Connected Wood Trusses
06200 Finish Carpentry
06402 Interior Architectural Woodwork

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07111 Waterproofing
07193 Vapor Barriers
07210 Building Insulation
07240 Exterior Insulation and Finish System
07411 Metal Roof Panels
07462 Fiber Cement Soffit Panels
07531 EPDM Membrane Roofing
07600 Sheet Metal Flashing and Trim
07725 Snow Guards
07920 Joint Sealants

DIVISION 8 – DOORS AND WINDOWS

08110 Steel Doors and Frames
08211 Wood Doors
08333 Security Grilles
08410 Aluminum Framed Entrance and Storefronts
08423 Revolving Doors
08441 Glazed Aluminum Curtain Walls
08443 Sloped Glazing Assemblies
08630 Metal Framed Skylights
08710 Door Hardware
08800 Glazing

DIVISION 9 – FINISHES

09260 Gypsum Board Assemblies
09300 Tile Work
09512 Acoustical Tile Ceiling
09651 Resilient Floor Tile
09680 Carpet
09912 Painting (Professional Line Products)

DIVISION 10 – SPECIALTIES

10155 Toilet Partitions
10350 Flagpoles
10426 Signage
10500 Metal/Wood Lockers
10520 Fire Protection Specialties
10650 Operable Partitions
10801 Toilet and Bath Accessories

DIVISIONS 11,12, 13

Not Used

DIVISION 14
14240 Hydraulic Elevators

DIVISION 15 – MECHANICAL and PLUMBING
15 010 GENERAL REQUIREMENTS
15 060 PIPES & PIPE FITTINGS
15 100 VALVES
15 120 PIPING SPECIALTIES
15 140 PIPING SUPPORTS & ANCHORS
15 190 MECHANICAL IDENTIFICATION
15 240 NOISE & VIBRATION CONTROL
15 250 INSULATION
15 330 FIRE PROTECTION SYSTEM
15 410 PLUMBING PIPING SYSTEMS
15 440 PLUMBING FIXTURES, SPECIALTIES & EQUIPMENT
15 510 HYDRONIC PIPING SYSTEMS
15 530 REFRIGERANT PIPING SYSTEMS
15 557 BOILERS
15 774 SPLIT SYSTEM HEAT PUMPS
15 780 COMPUTER ROOM AC UNITS
15 785 ROOFTOP AC UNITS
15 860 FANS AND ERV'S
15 890 DUCTWORK
15 910 DUCTWORK ACCESSORIES
15 940 AIR OUTLETS & INLETS
15 950 CONTROL

DIVISION 16 – ELECTRICAL
16010 GENERAL REQUIREMENTS
16110 RACEWAYS AND FITTINGS
16120 WIRE AND CABLE
16130 BOXES
16140 WIRING DEVICES
16420 ELECTRIC SERVICE
16425 SWITCHBOARD
16440 DISCONNECT SWITCHES
16450 GROUNDING
16470 PANELBOARDS
16475 FUSES
16480 MOTOR CONTROLLERS
16490 AUTOMATIC TRANSFER SWITCH
16501 LAMPS
16502 BALLASTS AND ACCESSORIES
16510 INDOOR LIGHTING FIXTURES
16520 OUTDOOR LIGHTING FIXTURES
16535 EMERGENCY LIGHTING FIXTURES
16620 EMERGENCY GENERATOR
16670 LIGHTNING PROTECTION SYSTEM
16721 FIRE ALARM SYSTEM
16730 CONDUIT AND CABLE TRAY
16740 IT SYSTEM
16770 SECURITY SYSTEM

APPENDIX
Test Boring Logs

City Hall

END OF TABLE OF CONTENTS

INVITATION TO BID

A. PROJECT IDENTIFICATION:
New City Hall for the City of Harrisonburg, Virginia

You are cordially invited to provide a Bid for construction of this project.

B. OWNER'S ADDRESS:
City of Harrisonburg
345 South Main Street
Harrisonburg, VA 22801

C. PLANS:
Drawings and Project Manuals, dated March 31, 2014, will be available from the offices of Mather Architects, PC, 373 Neff Avenue, Harrisonburg, Virginia, 22801, (540) 442-1400. Plans and specifications will require a $100.00 deposit. The deposit shall be one half (1/2) refundable upon return of the documents within 10 days following the bid and are in stapled, clean, and undamaged condition. An additional $20.00 shipping and handling fee is due, if mail or UPS delivery is required. You may contact the offices of Mather Architects, P.C. to receive sets of plans and specifications.

D. BID RECEIPT LOCATION
Purchasing Office
345South Main Street, Room 201
Harrisonburg, VA 22801

E. BID OPENING TIME
May 1, 2014, at 2:00 PM, local time
Bids will be opened publicly at the City Municipal Building, 345 South Main Street, Conference Room 205, Harrisonburg, VA 22801

F. MANDATORY PRE-BID MEETING
April 18, 2014, at 10:00 am, local time
City Council Chamber,
409 South Main Street,
Harrisonburg, VA 22801
All questions and answers discussed during the Pre-Bid meeting will be compiled and posted as an addendum on the City website www.harrisonburgva.gov/bids-proposals and also on eVA www.eva.virginia.gov.

G. IDENTIFICATION OF BID ENVELOPE:
Opaque, sealed envelope or box containing the bid shall be clearly identified with the following:
"**ITB #2014043-CMO-B**, **Bid for the New City Hall for the City of Harrisonburg, Virginia**"

H. BIDDER QUALIFICATIONS:

1. The bidder must be a Class "A" Virginia licensed contractor.

2. The bidder must be able to provide to the Owner a Performance and Payment Bond for 100% of the value of the project, if awarded the project. AIA Document A-311, "Performance Bond and Labor and Material Bond" shall be used as the form of the bond.

3. The bidder must provide a bid guarantee in the amount of 5% of the value of the project. This bid guarantee can be in the form of a cashiers check, certified check, or bid bond made payable to the Owner. This is to be included with the Bid Proposal.

4. Any bid received after the time indicated shall not be opened or considered, and shall be returned to the bidder.

6. The Owner may reject any bid that is not complete or properly prepared. Any deviation from the prepared Bid Form or from bidding the Contract Documents as shown may result in a rejection of the bid.

7. Bids may not be withdrawn for a period of 60 days after the bid opening. Refer to the "Instructions to Bidders".

8. Submitting a bid via facsimile or email is not acceptable.

9. All subcontractors with a contract amount over $50,000 with the General Contractor must also be bonded.

I. TIME OF COMPLETION:

Following the official Notice to Proceed from the owner, the General Contractor shall be Substantially Complete with Phase 1 of the project no later than 365 calendar days**.**

The General Contractor shall be Substantially Complete with Phase 2 of the project no later than 455 calendar days.

Liquidated damages do apply to each phase separately, at the rate of $500/day, if the construction is not Substantially Complete within those timeframes.

J. BID SUBMISSION CHECKLIST

All documents contained within the bid submission shall be completed in their entirety and signed and dated where required.

1. Signed Cover Page
2. Bid Form
3. Contractor Eligibility and Registration 0302
4. State Corporation Commission Form 0303
5. Non Collusion Affidavit 0304
6. Signed Addenda, if any
7. Statement of Bidder Qualifications
8. Proprietary/Confidential Information Identification Form
9. Bid Bond

K. AWARD OF CONTRACT

The City reserves the right to reject any and all Bids, to waive or not waive any and all informalities, to negotiate contract terms with the Successful Bidder, and the right to disregard all nonconforming, nonresponsive, or conditional Bids. Also, the City reserves the right to reject the BID of any BIDDER if the City believes that it would not be in the best interest of the project to make an award to that Bidder, whether because the BID 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 City. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

In evaluating Bids, the City will consider the qualifications of the BIDDERS, whether or not the BIDS comply with the prescribed requirements, and such alternatives, unit prices, and other data as may be requested in the Bid Forms or prior to the Notice of Award.

The City may conduct such investigations as the City deems necessary to assist in the evaluation of any BID and to establish the responsibility, qualifications and financial ability of the BIDDERS.

Proposed subcontractors, suppliers and other persons and organizations to perform or furnish the Work in accordance with the City Contract Documents to City's satisfaction within the prescribed time.

If the contract is awarded, it will be awarded to the lowest responsive, responsible Bidder whose evaluation by the City indicates to the City that the award will be in the best interests of the Project. If the Bid from the lowest responsive, responsible bidder exceeds available funds, the City may negotiate with the apparent low bidder to obtain a contract price within available funds.

L. LAST DAY FOR QUESTIONS DURING BIDDING

The last day that questions will be answered during the bidding process will be Monday, April 28, 2014. Questions will be answered up until 5:00 pm on that day. All questions should be directed in writing to John Mather, AIA, at the following location: Mather Architects, 373 Neff Ave., Harrisonburg, VA 22801. Email John@matherarchitects.com , fax 540-442-8100. Questions and answers will be posted as Addenda on the City website www.harrisonburgva.gov/bids-proposals and on eVA at www.eva.virginia.gov.

END OF INVITATION TO BID

BID FORM

TO: City of Harrisonburg
345 South Main Street
Harrisonburg, VA 22801

Bid Due: May 1, 2014 at 2:00 pm, local time

In response to the invitation to provide a bid submission for the construction of the New City Hall, we herewith submit our bid submission.

We have thoroughly examined the terms, conditions and content of the contract documents (drawings and project manual) dated March 31, 2014, and have examined the project site. We hereby propose to perform all work in accordance with the contract documents, including all necessary labor, materials, and administration, to fully construct the project, for the following sums of money:

A. BASE BID PROPOSAL:

1. All labor, material and administration for completion of the work shown in the contract documents and all Addenda.

_____

_____($_____)

B. CONTRACTOR REGISTRATION:

We are a Licensed Virginia Class A Contractor. Our Registration Number is _____.

C. The Bidder proposes to use the following major subcontractors on this project:

Mechanical: _____

Electrical: _____

D. In addition to this Bid Form, signed Addenda are attached

City Hall

E. BID SUBMITTED BY:

Corporate Officer: _____
Typed Name and Title

_____
Signature

Date of Bid: _____

END OF BID FORM

SECTION 00100 - GENERAL CONDITIONS

STANDARD AIA FORMS: General Conditions of the Contract, Standard Form A-201, 1997 Edition of The American Institute of Architects are hereby made a part of this specification to the same extent as if bound herein. The General Conditions, including Supplementary Conditions and other Division 1 Sections herein shall become a part of the Contract and shall apply to all Contractors and Subcontractors. Copies of the General Conditions may be examined at the Architect's office or obtained from The American Institute of Architects, Washington, D.C. 20006.
The form of the contract shall be the Standard Form of Agreement Between Owner and Contractor, AIA Document A101-1997

END OF SECTION 00100

SECTION 00110 - SUPPLEMENTAL CONDITIONS

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A-201, Edition, 1997. Where a portion of the General Conditions is modified or deleted by these Supplemental Conditions, the unaltered portions of the General Conditions remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

Add the following subparagraphs:

1.1.1.1 The term "provided" when used in the Contract Documents means the furnishing of all labor, materials, equipment, transportation, and services required, directly or indirectly.

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.5 Delete subparagraph 2.2.5 and substitute the following: "The Contractor will be furnished, free of charge, twelve copies of the drawings and project manual. The Contractor shall bear the cost of any additional copies at the cost of reproduction, postage, and handling."

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.2 Add the following sentences: "The Contractor shall also notify the Architect of any other condition found by him which would make it desirable in his judgment to modify the requirements of the Work in order to produce the best results. However, the Architect shall have the final authority to determine whether any change or modification should be made, and no change or modification of any kind shall be made, except on the Architect's instructions."

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following subparagraphs:

3.3.5 The Contractor shall be solely responsible for all grades, lines, and levels and for the work being within the permissible limits established by the survey furnished by the Owner under Paragraph 3.7

PERMITS, FEES AND NOTICES

Add the following subparagraphs:

3.7.5 The Contractor must be fully qualified under any state or local licensing law for contractors in effect at the time and at the location of the Work before requesting plans or submitting his bid. Only the bids of Contractors and Subcontractors duly licensed will be considered, if applicable. The Contractor shall be responsible for determining that all of his Subcontractors or prospective Subcontractors are duly licensed in accordance with the law.

3.7.6 The requirements of subparagraphs 3.7.2, 3.7.3 and 3.7.4 do not waive the Contractor's responsibility of complying with the requirements of the Contract Documents when such requirements exceed those of any laws, codes, ordinances, rules, regulations and lawful orders of any public authority bearing on the work.

3.9 SUPERINTENDENT

3.9.1 Add the following sentence: "It shall also be the responsibility of the Superintendent to transmit directions and communications to Subcontractors and follow through on the accomplishment of any directions contained in said communications."

3.15 CLEANING UP

3.15.1 Add the following at the end of paragraph: "In addition to the removal of rubbish and leaving the buildings "broom clean", the Contractor shall replace any broken glass, remove stains, spots, marks, and dirt from all surfaces; clean hardware, remove paint spots and smears from all surfaces; clean fixtures and wash all floors." Refer to Division 1 - 16 of the specifications for any additional or special requirements.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.10 Delete the provisions of this paragraph entirely.

ARTICLE 7 - CHANGES IN THE WORK

7.1 CHANGES

Add the following subparagraph:

7.1.5 Whenever total cost of changes exceeds 10% of the original Contract sum, Contractor shall obtain a "Consent of Surety" from the Bonding Company that issued the Performance and Payment Bonds, to assure coverage of the extra work.

7.3 CONSTRUCTION CHANGE DIRECTIVES

1. Cost to which overhead and profit is to be applied shall be determined in accordance with construction contract.
2. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. Itemization is required for any change exceeding $500.00 and in no case will a change involving over $500.00 be approved without such itemization.

ARTICLE 8 - TIME

8.2 PROGRESS AND COMPLETION

8.2.1. Add the following sentence: "Contract Time shall be based on consecutive calendar days. A calendar day is one of 24 hours beginning at 12:00 midnight.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 Add the following clause:

8.3.1.1 Normal rainfall or snow for the area, according to Weather Bureau records, shall not be a cause for an extension of the Contract Time unless such extension is agreed to in writing between Contractor and Owner.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following subparagraph:

9.2.2 The Schedule of Values form of submittal shall be AIA Document G-703.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 Add the following sentence: "The form of Application for Payment shall be a notarized AIA Document G-702, Application Certification for Payment, supported by AIA Document G-703, Continuation Sheet. Documents shall be latest edition and original of each Application shall be original printed forms. Photo copies shall be made only of filled-in forms."

Add the following clause:

9.3.1.1 Untill Substantial Completion, the Owner will pay 95 percent of the amount due the Contractor on account of progress payments.

9.7 FAILURE OF PAYMENT

Add the following subparagraph:

9.7.2 The provisions of this Article shall not apply after expiration of Contract Time.

9.8 SUBSTANTIAL COMPLETION

Add the following paragraph:

9.8.4 Upon Substantial Completion of the Work and upon the recommendations of the Architect, the Owner shall accept the work in accordance with the Certificate of Substantial Completion, AIA Document G-704. The Owner shall sign the Certificate of Substantial Completion of the Work and the Contractor shall cause the Certificate to be recorded in the mortgage office of the county in which the work has been done. The Contractor shall notify the Owner and Architect of the number and folio where said Certificate is recorded. Issuance of the Certificate of Substantial Completion does not constitute final acceptance.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Add the following clause:

9.10.2.1. Neither the final payment nor any part of the retained percentage shall become due until the Contractor shall deliver to the Owner a certificate by the Clerk of Court in the county in which the project is located, that the Owner's Substantial Completion Certificate has been recorded, more than thirty (30) days has elapsed since the recordation, and no liens have been recorded affecting this property and all affidavits, consents, and releases specified in subparagraph 9.9.2 have been submitted to the Architect.

Add the following paragraph:

9.11 LIQUIDATED DAMAGES

Liquidated Damages **do** apply to this contract. Following the official Notice the Proceed from the owner, the General Contractor shall be Substantially Complete with Phase 1 of the project no later than 365 calendar days. The General Contractor shall be Substantially Complete with Phase 2 of the project no later than 455 calendar days.

Liquidated damages shall apply to each phase separately, at the rate of $500/day, if the construction is not substantially completed within each of those timeframes.

ARTICLE 11 - INSURANCE AND BONDS

Add the following requirements to apply to all insurance and bonds required under Article 11:

(a) Insurance and bonds provided by the Contractor shall be with a reliable company (having at least an "A" Financial Rating or a "B" General Policyholder's Rating according to the latest A.M. Best Report) of the Contractor's choice, acceptable to and approved by the Owner and authorized to do business in the state where the project is located.

(b) The Contractor shall have the policies endorsed to reflect and insure any occupancy by Owner at the time of such occupancy.

(c) All liability policies referred to in this Article shall be maintained in the same company.

11.1 CONTRACTOR'S LIABILITY INSURANCE

Add the following clauses:

11.1.1.8 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises Operations (including X, C and U coverages as applicable).
2. Independent Contractor's Protective.
3. Products and Completed Operations.
4. Personal Injury Liability with Employment Exclusion deleted.
5. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
6. Owned, Non-Owned and Hired Motor Vehicles.
7. Broad Form Property Damage, including Completed Operations.

11.1.1.9 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or retroactive date shall pre-date the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with subparagraph 9.10.2.

11.1.2 Add the following clause:

" or until the date of completion of the work whichever is later. When there is a General Liability or an Excess Liability

Policy written on a claims made basis, the contractor must purchase tail coverage for the project, to be extended three years beyond the date of completion of the work".

11.1.2.1 The insurance required by subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Worker's Compensation
   (a) State: Statutory
   (b) Applicable Federal (e.g., Longshoremen's): Statutory
   (c) Employer's Liability:
      $500,000 Per Accident
      $500,000 Disease, Policy Limit
      $500,000 Disease, Each Employee
2. Comprehensive or Commercial General Liability (including Premises Operations, Independent Contractor's Protective, Products and Completed Operations, Broad Form Property Damage):
   (a) Bodily Injury:
      $1,000,000 Each Occurrence
      $3,000,000 Aggregate
   (b) Property Damage:

$1,000,000 Each Occurrence
$3,000,000 Aggregate

(c) Property Damage Liability Insurance shall provide X, C and U Coverage.

(d) Broad Form Property Damage Coverage shall include Completed Operations.

3. Contractual Liability

(a) Bodily Injury:
$1,000,000 Each Occurrence
$3,000,000 Aggregate

(b) Property Damage:
$1,000,000 Each Occurrence
$3,000,000 Aggregate

4. Personal Injury, with Employment Exclusion deleted.
$100,000 Each Occurrence

5. Business Auto Liability (including owned, non-owned, and hired vehicles):
Bodily Injury and Property Damage:
$1,000,000 Combined Singled Limit

6. If the General Liability coverages are provided by a Commercial Liability Policy, the:

(a) General Aggregate shall be not less than $1,000,000 and it shall apply, in total, to this project only.

(b) Fire Damage Limit shall be not less than $50,000 on any one fire.

7. Umbrella Excess Liability:
$5,000,000 over Primary Insurance (Minimum).

8. Aircraft Liability (owned and non-owned) when aircraft are used in the performance of the Contract: $1,000,000 Combined Single Limit.

9. Watercraft Liability (owned and non-owned) when watercraft are used in the performance of the Contract: $1,000,000 Combined Single Limit.

11.1.3 Add the following to this subparagraph: "If this insurance is written on the Comprehensive General Liability policy form, the Certificate shall be AIA Document G-705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD Form 25-S will be acceptable. The City requires the actual endorsement from the insurance company listing the City as an Additional Insured."

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 Delete the last two sentences of this paragraph and substitute the following: "The Contractor shall purchase and maintain insurance covering the Owner's contingent liability for claims which may arise from operations under the Contract. The owner will be named as an additional insured on the Contractor's insurance."

11.3 PROPERTY INSURANCE

11.3.1 In the first sentence delete "Unless otherwise provided, the Owner" and substitute "the Contractor."
Add the following sentence: "The form of policy for this coverage shall be Completed Value."

11.3.1.2 Delete this clause entirely.

11.3.1.3 Add the following sentence: "This coverage is written with a deductible of $1,000 per occurrence with an aggregate deductible of $1,000 for any occurrence."

11.3.1.4 Delete this clause and substitute the following: "The Contractor shall provide its own insurance coverage for portions of the Work stored off the site, after written approval of the Owner, at the value established in the approval and also portions of the Work in transit."

11.3.4 Delete this subparagraph entirely.

11.3.6 Delete this subparagraph and substitute the following:

"Before exposure to loss can occur, the Contractor shall file with the Owner two certified copies of the policy or policies providing this Property Insurance Coverage, each containing those endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Contractor. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner, then the Contractor shall bear all reasonable costs properly attributable thereto."

11.3.7 Delete the word "Owner" and substitute "Contractor" at the end of the first sentence.

11.3.8 Modify this subparagraph by substituting "Contractor" for "Owner" as fiduciary, except that at the first reference to "Owner" in the first sentence, the word "this" should be substituted for Owner's."

11.3.9 Delete "Owner" and substitute "Contractor" each time the former word appears.

11.3.10 Delete "Owner" and substitute "Contractor" each time the former word appears.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 Delete entirely and substitute the following:

The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. The cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum."

Add the following clauses:

11.4.1.1 The Contractor shall deliver the required insurance documents, W-9, and bonds to the Owner not later than three days following the date the Agreement is entered into; or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

11.4.7 Delete this section entirely.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

Add the following paragraph:

13.8 EQUAL OPPORTUNITY

13.8.1 The Contractor shall maintain policies of employment as follows:

13.8.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, national origin or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

Add the following paragraph:

14.2.5 Termination by the Owner for the reasons stated in subparagraph 14.2.1, will not relieve the Contractor of his obligations under the Liquidated Damages provision, and the Contractor shall be liable to the Owner for per diem Liquidated Damages.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

1.4.4.1 The Owner may, at any time, terminate the Contract in whole or in part for the Owner's convenience and without cause. Termination by the Owner under this Paragraph 14.4 shall be by a notice of termination delivered to the Contractor, specifying the extent of termination and the effective date.

14.4.2 Upon receipt of a written notice from the Owner of such termination, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph 14.4.:

.1 Cease operations as specified in the notice.

.2 Place no further orders and enter into no further subcontracts for materials, labor, services or facilities, except as necessary to complete portions of the Contract not terminated.

.3 Except for work directed to be performed prior to the effective date of termination stated in the notice, terminate all subcontracts and purchase orders to the extent they relate to the work terminated, and enter into no further subcontracts or purchase orders.

.4 Proceed to complete the performance of work not terminated.

.5 Take action that may be necessary or that the Owner may direct for the protection and preservation of the terminated work.

14.4.3 The amount to be paid to the Contractor by the Owner because of the termination shall consist of:

1. For work performed and for work in process on or off the site to the extent completed on the terminated portion of the Contract before the effective date, the cost of that work and the expense of settling and paying termination costs under the terminated subcontracts and purchase orders that are properly chargeable to the terminated portion of the Contract.

.2 The reasonable costs of settlement of the work terminated, including accounting, legal, clerical and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data; additional costs of termination and cancellation charges and settlement of subcontracts not already allowed under Clause 14.4.3.1; and storage, transportation and other costs incurred which are reasonably necessary for the preservation, protection or disposition of the terminated work.

.3 A fair and reasonable profit on the work contracted for.

14.4.4 Allowance shall be made for previous payments to the Contractor for the terminated portion of the work, and claims settled or pending under Article 4 between the Owner and Contractor, and for the value of materials, supplies, equipment and other items that are part of the cost of the work to be disposed of by the Contractor.

14.4.5 The term "cost" used in this Paragraph 14.4 shall be as listed in Subparagraph 7.3.6.

END OF SECTION 00110

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of construction of the New City Hall for the City of Harrisonburg, Virginia. The project also include phasing of the work, demolition of the existing Community Development Building, and related site work.

Owner: City of Harrisonburg
345 South Main Street
Harrisonburg, VA 22801

B. Contract Documents, dated March 31, 2014, were prepared for the Project by Mather Architects, located at 373 Neff Ave, Harrisonburg, VA 22801. To receive a printed copy, a deposit in the form of a check written to Mather Architects., in the amount of $100.00 per set, is required. This deposit shall be one half (1/2) refundable upon return of the documents within 10 days following the bid and are in stapled, clean, and undamaged condition, ready for reissuance.
Should shipping be required, a non-refundable shipping and handling charge of $20.00 per set will be charged.

C. Bids will be received no later than May 1, 2014, 2:00 P.M local time., at the Purchasing Office, Room 201, 345 South Main Street, Harrisonburg, VA 22801at which time they will be opened and read publicly in Room 205 Conference Room.

The opaque, sealed envelope or box containing the bid shall be clearly identified with the following: "ITB#2014043-CMO-B, Bid for the New City Hall for the City of Harrisonburg, VA."

D. Bid requirements:

1. The bidder must provide a bid guarantee in the amount of 5% of the value of the project. This bid guarantee can be in the form of a cashiers check, certified check, or bid bond made payable to the Owner. This is to be included with the Bid Proposal.

2. Any bid received after the time indicated shall not be opened and will not be considered and shall be returned to the bidder. Any bid may be withdrawn prior to the time for opening with written request to Mr. Ande Banks, Director of Special Projects and Grant Management, at the City of Harrisonburg.

3. The Owner may reject any bid that is not complete or properly prepared. Any deviation from the prepared Bid Form or from bidding the Contract Documents as shown may result in a rejection of the bid. The Owner reserves the right to reject all bids and to waive or not waive any informality in any bid.

4. Bids may not be withdrawn for a period of 60 days after the bid opening.

5. Submitting a bid via facsimile or email is not acceptable.

6. All subcontractors with a contract amount over $50,000 with the General Contractor must also be bonded

1.3 WORK UNDER OTHER CONTRACTS

A. The Owner will contract separately for purchase of **all loose furniture, window treatments, landscaping,** and anything beyond what is shown on the Civil drawings.

1.4 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have use of the premises for construction operations. However, those operations must be limited to areas that allow for:

- Normal operations of the current Municipal Building,
- Normal operations of the Community Development Building

The "green space" located just to the south of the Farmers market (and east of Liberty Street) is available to the Contractor for use during construction.

1.5 PHASING OF THE WORK

Following is a general description of the required Phasing of the construction work. This is an extremely general outline, and does not include all the items that must be scheduled and coordinated in order to achieve this general sequence of work. After the award of the Contract, the Contractor shall submit a detailed construction schedule for review and approval by the City. This schedule should address the many coordinated events that must occur to achieve this general Phasing of the work.

Phase 1 – Demolish the existing Conference Room and Garage wing of the Community Development Building. Patch and repair the building afterwards so that this building can remain operational all during the construction of the New City Hall. Shore, brace and underpin the Community Development Building as necessary during this process.
Relocate utilities either permanently or temporarily, as required. Construct the New City Hall building. Provide necessary safety protection measures to the people who will occupy the Community Development Building and the Municipal Building, all during construction. Maintain vehicular access to the front and rear of the Community Development Building via Warren Street.
Relocate the existing Board Room desk to the new building.

Phase 2 – Demolish the existing Community Development Building. Complete the new parking lot and other site work, as indicated on the Civil Plans.

1.6 ROCK AND UNSUITABLE SOILS

The site work is to be bid as UNCLASSIFIED. The Contractor shall be responsible for all required removal of rock and unsuitable soils as part of the Base Bid. Test borings have been performed in the project area, and are included with this Project manual.

1.7 TIME OF COMPLETION

Following the official Notice the Proceed from the owner, the General Contractor shall be Substantially Complete with Phase 1 of the project no later than 365 calendar days.
The General Contractor shall be Substantially Complete with Phase 2 of the project no later than 455 calendar days.
Liquidated damages do apply to each phase separately, at the rate of $500/day, if the construction is not Substantially Completed within those timeframes.

1.8 NEGOTIATIONS WITH THE LOWEST BIDDER

- Unless all BIDS are cancelled or rejected, the CITY reserves the right granted by subsection 2.2-4318 of the Code of Virginia to negotiate with the lowest responsive, responsible bidder to obtain a contract price within the funds available to the CITY whenever such low bid exceeds the CITY'S available funds.

- For the purpose of determining when such negotiations may take place, the term “available funds” shall mean those funds which were budgeted by the CITY for this contract.
- Negotiations with the low bidder may include both modifications of the bid price and the Scope of Work/Specifications to be performed. The CITY shall initiate such negotiations by written notice to the lowest responsive, responsible bidder that its BID exceeds the available funds and that the agency wishes to negotiate a lower contract price. The times, places, and manner of negotiating shall be agreed to by the CITY and the lowest responsive, responsible bidder.

END OF SECTION 01010

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of the Architect.
   c. Project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.

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

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Times: The date for each progress payment is the 15th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days prior to the date for each progress payment.

C. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.

D. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from every entity who is lawfully entitled to file a mechanics lien arising out of the Contract and related to the Work covered by the payment.

E. Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:

   1. List of subcontractors.
   2. List of principal suppliers and fabricators.
   3. Schedule of Values.
   4. Contractor's Construction Schedule (preliminary if not final).
   5. Schedule of principal products.
   6. Schedule of unit prices.
   7. Submittal Schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
   9. List of Contractor's principal consultants.
   10. Copies of building permits.
   11. Copies of authorizations and licenses from governing authorities for performance of the Work.
   12. Initial progress report.
   13. Report of pre-construction meeting.
   14. Certificates of insurance and insurance policies.
   15. Performance and payment bonds.
   16. Data needed to acquire the Owner's insurance.
   17. Initial settlement survey and damage report, if required.

F. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include:

a. Occupancy permits and similar approvals.
b. Warranties (guarantees) and maintenance agreements.
c. Test/adjust/balance records.
d. Maintenance instructions.
e. Meter readings.
f. Startup performance reports.
g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
h. Final cleaning.
i. Application for reduction of retainage and consent of surety.
j. Advice on shifting insurance coverages.
k. Final progress photographs.
l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

G. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims will be settled.
4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
5. Transmittal of required Project construction records to the Owner.
6. Certified property survey.
7. Proof that taxes, fees, and similar obligations were paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish, and similar elements.
10. Change of door locks to Owner's access.

END OF SECTION 01027

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
2. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and pre-installation conferences.
3. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
4. Division 1 Section "Materials and Equipment" for coordinating general installation.
5. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner. Commencement of work shall constitute acceptance of conditions under which Work is to be performed.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:

1. Establishing benchmarks, central points, grades, lines and measurements as shown on the drawings.
2. Design of all centering, forms or other means of support required to complete the construction shown.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittals" for submitting Project record surveys.
3. Division 1 Section "Project Closeout" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.

B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

A. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located, to perform required land-surveying services.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

B. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

B. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

C. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

D. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01050

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Pre-construction conferences.
2. Progress meetings.
3. Coordination meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data, and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Parking availability.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

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

1.5 COORDINATION MEETINGS

A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings.

B. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

END OF SECTION 01200

SECTION 01210 – ALLOWANCES and UNIT COSTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain materials and equipment are specified in the Contract Documents by allowances. Installation of all allowance items is to be included by the Contractor in the Base Bid price.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.4 SUBMITTALS

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

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

1.6 EXAMINATION

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

1.7 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

1.8 SCHEDULE OF ALLOWANCES

A. Allowance No. 1 – Allow $1,500 for the fabrication of a 30” x 24” cast aluminum Dedication plaque. The plaque shall be wall mounted. The Plaque shall have the project name, date and the names of individual and companies associated with the project cast into the metal.

END OF SECTION 01210

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Submittal schedule.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Quality assurance submittals.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of subcontractors.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
4. Division 1 Section "Quality Control" specifies requirements for submittal of inspection and test reports.
5. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 by 5 inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken.

a. Project name.
b. Date.
c. Name and address of the Architect.
d. Name and address of the Contractor.
e. Name and address of the subcontractor.
f. Name and address of the supplier.
g. Name of the manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for "Commencement of the Work."

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."
2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

C. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.

3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches
7. Submittals: Submit 6 copies of blue- or black-line prints, plus the number of prints needed by the Architect for distribution. The Architect will retain 2 copies and return the remainder.
8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.7 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.8 SAMPLES

A. Submit fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern. Architect will select final colors and finishes and return a written schedule of finishes.

1.9 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.10 ARCHITECT'S ACTION

A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. The **Owner** will retain the services of all third party special inspection agency to perform “Special Inspections” as required by the International Building Code, 2009 edition.

E. The **Owner** shall retain the services of a Geotechnical engineer for testing of soils on site.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are to be included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are to be included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

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

D. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01400

SECTION 01421 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which

the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the 16-division format and CSI/CSC's "MasterFormat" numbering system.

B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

END OF SECTION 01421

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Temporary heat.
4. Ventilation.
5. Telephone service.
6. Sanitary facilities, including drinking water.

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Dewatering facilities and drains.
3. Temporary enclosures.
4. Temporary project identification signs and bulletin boards.
5. Rodent and pest control.
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Warning signs, barricades, fences, and lights.
2. Environmental protection.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- (16-mm-) thick exterior plywood.

C. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

D. Water: Provide potable water approved by local health authorities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Submittals" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 1 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, which is current as of the date of the Contract Documents.
   b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
2. Semi-proprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these

products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

END OF SECTION 01600

SECTION 01631 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 1 Section "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: The Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.

    a. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
    b. Samples, where applicable or requested.

3. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution.

END OF SECTION 01631

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

    a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
9. Complete final cleanup requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of

Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Receipt of final report from Owner’s Special Inspector. Refer to Section 01400 for list of inspections.

B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line whiteprints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.

2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

E. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.

12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section "Construction Facilities and Temporary Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01700

SECTION 01740 – WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION 01740

0302 CONTRACTOR ELIGIBILITY AND REGISTRATION

This is to certify that I (we) are not currently barred from bidding on contracts by any agency of The Commonwealth of Virginia, nor am I (we) a part of any firm/corporation that is currently barred from bidding on contracts by any agency of The Commonwealth of Virginia.

Check one:

_____I am currently registered as a contractor in the Commonwealth of Virginia.

_____My registration number is _____

_____I am currently not required to register as a contractor in the Commonwealth of Virginia per Chapter 11, Title 54 of the Code of Virginia.

_____
Contractor

[SEAL]

_____
Address

_____

_____

_____
Attest

By:_____
Signature

_____
Title

_____
Date

MUST BE RETURNED WITH BID

0303 State Corporation Commission Form

Virginia State Corporation Commission ("SCC") registration information:

The undersigned Offeror:

☐ is a corporation or other business entity with the following SCC identification number: _____ **-OR-**

☐ is not a corporation, limited liability company, limited partnership, registered limited liability partnership, or business trust **-OR-**

☐ is an out-of-state business entity that does not regularly and continuously maintain as part of its ordinary and customary business any employees, agents, offices, facilities, or inventories in Virginia (not counting any employees or agents in Virginia who merely solicit orders that require acceptance outside Virginia before they become contracts, and not counting any incidental presence of the Offeror in Virginia that is needed in order to assemble, maintain, and repair goods in accordance with the contracts by which such goods were sold and shipped into Virginia from bidder's out-of-state location) **-OR-**

☐ is an out-of-state business entity that is including with this bid an opinion of legal counsel which accurately and completely discloses the undersigned Offeror's current contacts with Virginia and describes why those contacts do not constitute the transaction of business in Virginia within the meaning of § 13.1-757 or other similar provisions in Titles 13.1 or 50 of the Code of Virginia.

****NOTE**** >> Check the following box if you have not completed any of the foregoing options but currently have pending before the SCC an application for authority to transact business in the Commonwealth of Virginia and wish to be considered for a waiver to allow you to submit the SCC identification number after the due date for proposals (the Commonwealth reserves the right to determine in its sole discretion whether to allow such waiver): ☐

Signature: _____ **Date:** _____

Name: _____
Print

Title: _____

Name of Firm: _____

MUST BE RETURNED WITH BID

0304 NON-COLLUSION AFFIDAVIT

Under oath, I hereby affirm under penalty of perjury:

(1) That I am the bidder or a partner of the bidder, or an officer or employee of the bidding corporation with authority to sign on its behalf;

(2) That the attached bid or bids have been arrived at by the bidder and have been arrived at and submitted without collusion or any design to limit bidding or competition;

(3) That the contents of the bid or bids have not been communicated to any person not an employee or agent of the bidder on any bid furnished with the bid or bids, and will not be communicated to any such person prior to the official opening of the bid or bids; and

(4) That I have fully informed myself regarding the accuracy of the statements made in this affidavit.

Signed_____

Title_____

Firm Name _____

CITY OF HARRISONBURG
COMMONWEALTH OF VIRGINIA, to wit:

I, _____, a Notary Public, do certify that

_____whose name is signed to the foregoing has

this date acknowledged the same before me in my City foresaid.

Given under my hand this_____day of_____, 20___.

My Commission expires_____.

_____
Notary Public

MUST BE RETURNED WITH BID

Formatted: Font: 12 pt, Bold, Underline, Font color: Text 1

GENERAL TERMS AND CONDITIONS FOR THE CITY OF HARRISONBURG, VA

PURCHASING AND CONTRACTING MANUAL: This solicitation is subject to the provisions of The Purchasing and Contracting Policy Manual for the City of Harrisonburg (City) and any revisions thereto, which are hereby incorporated into this contract in their entirety. A copy of the manual is available for review at www.Harrisonburgva.gov/bids.

APPLICABLE LAWS AND COURTS: This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia and any litigation with respect thereto shall be brought in the courts of the Commonwealth. The contractor shall comply with all applicable federal, state and local laws, rules and regulations.

ANTI-DISCRIMINATION: By submitting their (bids/proposals), (bidders/offerors) certify to the City that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and 2.2-4311 of the *Virginia Public Procurement Act*.

In every contract over $10,000 the provisions below apply:

1. During the performance of this contract, the contractor agrees as follows:

    a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

    b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.

    c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting these requirements.

    The contractor will include the provisions of 1. above in every subcontract or purchase order over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

2. The City does not discriminate against small and minority businesses or faith based organizations.

ETHICS IN PUBLIC CONTRACTING: By submitting their (bids/proposals), (bidders/offerors) certify that their (bids/proposals) are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other (bidder/offeror), supplier, manufacturer or

subcontractor in connection with their (bid/proposal), and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

IMMIGRATION REFORM AND CONTROL ACT OF 1986: By submitting their (bids/proposals), (bidders/offerors) certify that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the federal Immigration Reform and Control Act of 1986.

DEBARMENT STATUS: By submitting their (bids/proposals), (bidders/offerors) certify that they are not currently debarred by the Commonwealth of Virginia from submitting bids or proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.

ANTITRUST: By entering into a contract, the contractor conveys, sells, assigns, and transfers to the City all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the City under said contract.

PAYMENT:

1. To Prime Contractor:

    a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the Architect, as per the General Conditions of the Contract.

    b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however.

    c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price.

    d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or the date of offset when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act.

    e. Individual contractors shall provide their social security numbers, and proprietors , partnerships, and corporations shall provide the City with a federal employer identification number, prior to receiving any payment from the City.

    f. **Unreasonable Charges**. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon

determining that invoiced as to those charges which it considers unreasonable and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification. The provisions of this section do not relieve the City of its prompt payment obligations with respect to those charges which are not in dispute (*Code of Virginia*, 2.2.4363.

2. To Subcontractors:

   a. A contractor awarded a contract under this solicitation is hereby obligated:

      (1) To pay the subcontractor(s) within seven (7) days of the contractor's receipt of payment from the City for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or

      (2) To notify the City and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason.

   b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the City, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the City.

PRECEDENCE OF TERMS: General Terms and Conditions shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

QUALIFICATIONS OF (BIDDERS/OFFERORS): The City may make such reasonable investigations as deemed proper and necessary to determine the ability of the (bidder/offeror) to perform the services/furnish the goods and the (bidder/offeror) shall furnish to the City all such information and data for this purpose as may be requested. The City reserves the right to inspect (bidder's/offeror's) physical facilities prior to award to satisfy questions regarding the (bidder's/offeror's) capabilities. The City further reserves the right to reject any (bid/ proposal) if the evidence submitted by, or investigations of, such (bidder/offeror) fails to satisfy the City that such (bidder/offeror) is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

TESTING AND INSPECTION: The City reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

ASSIGNMENT OF CONTRACT: A contract shall not be assignable by the contractor in whole or in part without the written consent of the City.

CHANGES TO THE CONTRACT: Changes can be made to the contract in any of the following ways:

1. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.
2. The Purchasing Agent or City delegated agent may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt. The contractor shall be compensated for any additional costs incurred as the result of such order and shall give the City a credit for any savings.

DEFAULT: In case of failure to deliver goods or services in accordance with the contract terms and conditions, the City, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies, which the City may have.

CANCELLATION OF THE CONTRACT: The City may terminate any agreement resulting from this solicitation at any time, for any reason or for no reason, upon thirty days advance written notice to the Contractor. In the event of such termination the Contractor shall be compensated for services and work performed prior to termination.

TAXES: Sales to the City of Harrisonburg are normally exempt from State sales tax. State sales and use tax certificates of exemption, Form ST-12, will be issued upon request.
(NOT NORMALLY REQUIRED FOR SERVICE CONTRACTS)

USE OF BRAND NAMES: Unless otherwise provided in this solicitation, the name of a certain brand, make or manufacturer does not restrict (bidders/offerors) to the specific brand, make or manufacturer named, but conveys the general style, type, character, and quality of the article desired. Any article which the public body, in its sole discretion, determines to be the equal of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted. The (bidder/offeror) is responsible to clearly and specifically identify the product being offered and to provide sufficient descriptive literature, catalog cuts and technical detail to enable the City to determine if the product offered meets the requirements of the solicitation. This is required even if offering the exact brand, make or manufacturer specified. Normally in competitive sealed bidding only the information furnished with the bid will be considered in the evaluation. Failure to furnish adequate data for evaluation purposes may result in declaring a bid nonresponsive. Unless the (bidder/offeror) clearly indicates in its (bid/proposal) that the product offered is an "equal" product, such (bid/proposal) will be considered to offer the brand name product referenced in the solicitation.**(NOT NORMALLY REQUIRED FOR SERVICE CONTRACTS)**

TRANSPORTATION AND PACKAGING: By submitting their (bids/proposals), all (bidders/offerors) certify and warrant that the price offered for FOB destination includes only the actual freight rate costs at the lowest and best rate and is based upon the actual weight of the goods to be shipped. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order number, commodity description, and quantity.**(NOT NORMALLY REQUIRED FOR SERVICE CONTRACTS)**

INSURANCE: By signing and submitting a bid or proposal under this solicitation, the bidder or offeror certifies that if awarded the contract, it will have insurance coverages per the solicitation document

at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with 2.2-4332 and 65.2-800 et seq. of the *Code of Virginia*. The bidder or offeror further certifies that the contractor and any subcontractors will maintain these insurance coverages during the entire term of the contract and that all insurance coverages will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission. **(NOT NORMALLY REQUIRED FOR GOODS CONTRACTS. INSURANCE IS REQUIRED WHEN WORK IS TO BE PERFORMED ON CITY OWNED OR LEASED FACILITIES OR PROPERTY.)**

AVAILABILITY OF FUNDS: Agreements are made subject to the appropriation of funds by the Harrisonburg City Council and are null and void in the event of non-appropriation by the City Council. Non-appropriation of funds shall not be deemed a cancellation and shall terminate this agreement without recourse and with no liability on the part of the City.

SELECTION PROCESS/AWARD: Upon the award or the announcement of the decision to award a contract as a result of this solicitation, the department will publicly post such notice for a minimum of ten (10) days, or will notify all responsive bidders/offerors.

BID/PROPOSAL ACCEPTANCE PERIOD: Any bid/proposal resulting from this solicitation shall be valid for (60) days. At the end of the (60) days the bid/proposal may be withdrawn at the written request of the Bidder/Offeror. If the bid or proposal is not withdrawn at that time it remains in effect until an award is made or the solicitation is canceled.

EXCUSABLE DELAY: The City shall not be in default of any failure in performance of this agreement in accordance with its terms if such failure arises out of causes beyond its reasonable control and without the fault of or negligence of the City. Such causes may include, but are not restricted to acts of God or the public enemy, fires, flood, epidemics, quarantine restrictions, strikes, freight embargoes, and usually severe weather, but in every case the failure to perform must be beyond the reasonable control and without the fault or negligence of the City.

DRUG-FREE WORKPLACE: During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

SAFETY and OSHA STANDARDS: All parties performing services for the City shall comply with all Occupational Safety and Health Administration (OSHA), State Occupational Health Standards, and any other applicable rules and regulations. All parties shall be held responsible for the training, supervision, and safety of their employees. Any unsafe acts or hazardous conditions that may cause injury or damage to any persons or property within and around the work site areas under this contract shall be remedied per the regulatory agency's guidelines.

PERMITS AND FEES: All proposals submitted shall have included in price the cost of any business or professional licenses, permits or fees required by the City of Harrisonburg or the Commonwealth of

Virginia. The offeror must have all necessary licenses to perform the services in Virginia and, if practicing as a corporation, be authorized to do business in the Commonwealth of VA.

COOPERATIVE PROCUREMENT: This procurement is being conducted on behalf of other public bodies, in accordance with 2.2-4304 (A) of the Code of VA. The successful bidder has the option to provide these same items (services), except architectural and engineering services, at the same prices, awarded as a result of this solicitation to any public body within the Commonwealth of Virginia. If any other Public body decides to use the final contract, the contractor(s) must deal directly with that public body concerning the placement of orders, issuance of the purchase orders, contractual disputes, invoicing and payment. Failure to extend a contract to any public body will have no effect on consideration of your bid.

LIABILITY AND LITIGATION: The City shall not indemnify or hold harmless any Contractor or other third party. The City does not waive any right or release any party from liability, whether on its own behalf or on behalf of any boards, employees or agents. The City does not waive the right to trial by jury for any cause of action arising from the Contract and shall not submit any Contract claim to binding arbitration or mediation. The City shall not be liable to Contractor for any special, punitive or exemplary damages arising from the performance of the contract, including, but not limited to, incidental damages, and lost profit and lost wages, even if such special damages are reasonably foreseeable. Any provision(s) in the Contract contrary to these statements is/are hereby deleted and rendered void.

STATE CORPORATION COMMISSION IDENTIFICATION NUMBER: Pursuant to Code of VA 2.2-4311.2 subsection B, a bidder or offeror organized or authorized to transact business in the Commonwealth pursuant to Title 13.1 or Title 50 is required to include in its bid or proposal the identification number issued to it by the State Corporation Commission (SCC). Any bidder or offeror that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law is required to include in its bid or proposal a statement describing why the bidder or offeror is not required to be so authorized. Link to the SCC site is http://www.scc.virginia.gov.

UNENFORCEABLE PROVISIONS: The Contractor specifically agrees that, notwithstanding any provisions appearing in the contract between the parties, none of the following shall have any effect or be enforceable against the City:

1. Requiring the City to maintain any type of insurance either for the City's benefit or for the contractor's benefit;

2 Renewing or extending the agreement beyond the initial term or automatically continuing the contract period from term to term;

3. Requiring or stating that the terms of any agreement or contract between the parties shall prevail over the terms of this addendum in the event of conflict;

4. Requiring the City to indemnify or to hold harmless the Contractor for any act or omission;

5. Imposing interest charges contrary to that specified by *Virginia Code* § 2.2-4347 through 2.2-4354, Prompt Payment;

6. Requiring the application of the law of any state other than Virginia in interpreting or enforcing the contract or requiring or permitting that any dispute under the contract be resolved in the courts of any state other than Virginia;

7. Requiring any total or partial compensation or payment for lost profit or liquidated damages by the City if the contract is terminated before its ordinary period;

8. Requiring that the contract be "accepted" or endorsed by the home office or by any other officer subsequent to execution by an official of the City before the contract is considered in effect;

9. Delaying the acceptance of this contract or its effective date beyond the date of execution;

10. Limiting or adding to the time period within which claims can be made or actions can be brought;

11. Limiting the liability of the Contractor for property damage or personal injury;

12. Permitting unilateral modification of this contract by the Contractor;

13. Binding the City to any arbitration or to the decision of any arbitration board, commission, panel or other entity;

14. Obligating the City to pay costs of collection or attorney's fees;

15. Granting the Contractor a security interest in property of the City;

16. Bestowing any right or incurring any obligation that is beyond the duly granted authority of the undersigned agency representative to bestow or incur on behalf of the City.

CITY OF HARRISONBURG, VA

NOTICE OF AWARD

Date _____

Name _____

Address _____

Your Bid/Offer Dated _____

In Response To Bid/RFP #_____

To Furnish _____

During the Period _____

hereby is accepted at prices and terms stated, subject to all conditions and requirements of the solicitation, purchase specifications, warranties, performance bond and other stipulations, if any.

_____

Kurt Hodgen, City Manager

OR

Anne Lewis, Assistant City Manager

For City of Harrisonburg, VA

0502 NOTICE TO PROCEED

DATE:_____

TO: _____

_____

_____

Re: **City of Harrisonburg**

PROJECT TITLE: _____

PROJECT NO: _____

In accordance with the Contract between the City of Harrisonburg and Contractor you are notified that the Time for Completion under the above Agreement will commence to run on _____ , 20 _____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Contract between Owner and Contractor, the Work shall be substantially completed within _____ calendar days from and after the said date, which is _____, 20_____.

Before you may start any Work at the site, the City of Harrisonburg requires that you deliver to the City the Certificates of Insurance which the Contractor is required to purchase and maintain in accordance with the Contract Documents.

By _____
Owner Authorized Signature

_____
Name & Title (Print)

STATEMENT OF BIDDER QUALIFICATIONS

1. **Company name, bidder email, mail address and all branch office addresses.**

_____

_____

_____

_____

2. **Type of business entity (corporation, non-for-profit, proprietorship, etc.).**

_____

_____

_____

_____

3. **If company is a corporation, state the date and place of incorporation and give a brief history of company's operations.**

_____

_____

_____

_____

4. **List directors, officers, owners, managerial employees or partners, and identify the ownership interest of each.**

5. **Total number of employees and total number of licensed professionals (include an organizational chart, if available).**

6. **Identify locations from which services will be performed.**

7. **Identify or attach license or certificates to perform the work in each jurisdiction where the work will take place.**

8. **Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If yes, list the name of the individual, license held and disposition of the issue.**

_____

_____

_____

_____

9. **Has any director, officer, owner or managerial employee been convicted or the subject of criminal indictment during the past five (5) years? If yes, summarize the matter and its disposition.**

_____

_____

_____

_____

10. **Is the company currently involved in bankruptcy or similar proceedings? If yes, explain.**

_____

_____

_____

_____

11. **During the past three (3) years, has company been found guilty of any OSHA, EPA or State environmental or safety violation? If yes, describe the nature of the violation and steps taken to remediate the condition(s).**

_____

_____

_____

_____

12. **During the past five (5) years, has company been charged with retaliation or discrimination against any employee on the basis of race, ethnicity, national origin, disability, gender or other violation of equal employment opportunities? If yes, summarize each claim and its disposition.**

_____

_____

_____

_____

13. **During the past five (5) years, has company been named as a party in any action involving a claim for personal injury or wrongful death arising from performance of work on any project? If yes, summarize the claim and its disposition.**

_____

_____

_____

_____

14. **During the past five (5) years, has company been the subject of an investigation or proceedings before the city, state or federal Departments of Labor for any alleged violation of any wage or labor law? If yes, summarize each such instance and its disposition.**

_____

_____

_____

_____

15. **Has the company ever been terminated from a project by the Owner? If yes, list the projects on which the bidder was terminated, the nature of the termination (e.g., convenience, suspension, for cause), and the date of said termination.**

_____

_____

_____

_____

16. **List the technical and professional staff to be employed on this project; describe general and specific specialties/expertise and overall resources; provide title, role and work resume of each team member, including principals.**

_____

_____

_____

_____

17. **Indicate your understanding of the scope of work involved in the project and potential problems to be addressed. Summarize how you will respond to specific phases of the work, identifying any innovative or creative design approaches or strategies that the company proposes.**

_____

_____

_____

_____

_____

_____

18. **Describe the nature and level of communications company will maintain with City staff during the various project phases.**

_____

_____

_____

_____

19. **Discuss any special or specific qualifications company has for this project.**

_____

_____

_____

_____

20. Describe how company will ensure Project performance, quality and consistency through adequate management, supervision and control techniques.

_____

_____

_____

_____

21. Describe company's system of monitoring and oversight to ensure maintenance of complete and accurate work, payroll and invoicing records.

_____

_____

_____

_____

22. Does company have any projects ongoing at the time of the submission of this bid? If yes, list the projects on which the bidder is currently working, the percentage now complete, and the expected dates of completion.

_____

_____

_____

23. Attach company's most current certified financial statement or, if a certified statement has not been issued within the past 12 months, the company's latest internal financial statement. Sensitive information regarding finances, etc may be identified on the Proprietary/Confidential Information Identification Form provided.

By:_____
(Signature)

_____
(Print Name, Title and Company)

Dated:

Sworn to before me this _____day of _____,20__.

_____
Notary Public

<u>MUST BE PROVIDED WITH BID</u>

PROPRIETARY/CONFIDENTIAL INFORMATION IDENTIFICATION

Name of Firm/Offeror:_____

Trade secrets or proprietary information submitted by an offeror shall not be subject to public disclosure under the Virginia Freedom of Information Act; however, the offeror must invoke the protections of §2.2-4342F of the Code of Virginia, in writing, either before or at the time the data or other material is submitted. The written notice must specifically identify the data or materials to be protected, including the section of the proposal in which it is contained, as well as the page number(s), and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute a trade secret or proprietary information. In addition, a summary of proprietary information provided shall be submitted on this form. The designation of an entire proposal document, line item prices, and/or total proposal prices as proprietary or trade secrets is not acceptable. If, after being given reasonable time, the offeror refuses to withdraw such a classification designation, the proposal will be rejected.

SECTION/TITLE	PAGE NUMBER(S)	REASON(S) FOR WITHHOLDING FROM DISCLOSURE

☐ Check this box if there are none.

MUST BE INCLUDED WITH BID

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with fly ash, ground granulated blast-furnace slag, or silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing materials.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: G.C shall hire an independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60 deformed.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Fly Ash: ASTM C 618, Class C or F.

C. Normal-Weight Aggregate: ASTM C 33, uniformly graded.

1. Nominal Maximum Aggregate Size: 1 inch (19 mm).

D. Water: Potable and complying with ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 FILL MATERIAL UNDER SLABS

A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Clear, Waterborne, Membrane-Forming Curing Compound:
   a. Safe Cure and Seal; Dayton Superior Corporation.
   b. Diamond Clear VOX; Euclid Chemical Co.
   c. Vocomp-20; W. R. Meadows, Inc.
   d. Rich Seal 14 percent E; Richmond Screw Anchor Co.
   e. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.
   f. Cure & Seal 14 percent; Symons Corporation.

2.7 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.8 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): **4000 psi** or as indicated on structural drawings.
2. Maximum Slump: 5 inches.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

E. Maximum Water-Cementitious Materials Ratio: 0.45.

F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4 to 6 percent, unless otherwise indicated.

G. Do not air entrain concrete for trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

I. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture sheet waterproofing. Repair damage and reseal sheet waterproofing before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Shop- or field-weld reinforcement according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.2 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

3.3 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.4 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15; for carpeted slabs.

D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.5 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.6 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.7 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.

Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: G.C. will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of six standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
   a. Test two field-cured specimens at 7 days and two at 28 days.
   b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
   c. Retain two specimens for testing as directed by the Architect.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 03410 - PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Precast structural concrete.

B. Related Sections:

1. Division 3 Section "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
2. Division 5 Section "Structural Steel" for furnishing and installing connections attached to structural-steel framing.
3. Division 5 Section "Metal Fabrications" for kickers and other miscellaneous steel shapes.
4. Division 7 Section "Sheet Metal Flashing and Trim" for flashing receivers and reglets.
5. Division 7 Section "Through-Penetration Firestop Systems" for joint-filler materials for fire-resistance-rated construction.
6. Division 7 Section "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 DEFINITION

A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.

C. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Dead Loads: 8 PSF (Superimposed Dead Load).
2. Concrete Topping Load: 2 PSF.

3. Live Loads: 40 PSF.
4. Roof Loads: N/A.
5. Snow Loads: N/A.
6. Seismic Loads: Importance factor = 1.0, Use group = I, Seismic design category = A, Seismic site class = C
7. Wind Loads: Basic wind speed = 90 mph. Importance factor = 1.0, Exposure category = B, Height adjustment factor = 1.22.
8. Load combinations: 1.2D + 1.6L
9. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318.

    a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 18 to plus 120 deg F.

    b. Maximum Live Load deflection to be L/480.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.

1. Indicate joints, reveals, and extent and location of each surface finish.
2. Indicate separate face and backup mixture locations and thicknesses.
3. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
4. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
5. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
6. Include and locate openings larger than by 10 inches.
7. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
8. Indicate relationship of precast structural concrete units to adjacent materials.
9. Indicate locations and details of brick units, including corner units and special shapes, and joint treatment.
10. Indicate locations and details of stone facings, anchors, and joint widths.
11. Indicate estimated camber for precast floor slabs with concrete toppings.
12. Indicate shim sizes and grouting sequence.
13. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do

not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples:

1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

E. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For Installer.

G. Welding certificates.

H. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.
6. Brick units and accessories.
7. Stone anchors and accessories.

I. Material Test Reports: For aggregates.

J. Source quality-control reports.

K. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's Plant Certification program at time of bidding and is designated a PCI-certified plant as follows:
a. Group C, Category C2 - Prestressed Hollowcore and Repetitively Produced Products Category C2A - Prestressed Hollowcore and Repetitively Produced Products.

B. Installer Qualifications: A precast concrete erector qualified at time of bidding, as evidenced by PCI's Certificate of Compliance, to erect Category S2 - Complex Structural Systems.

C. Installer Qualifications: An experienced precast concrete erector who, before erection of precast concrete, has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems and who produces an Erectors' Post Audit Declaration, according to PCI MNL 127, "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products."

D. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

E. Design Standards: Comply with ACI 318 and design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

F. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

G. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel."
2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."

H. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
2. Place adequate dunnage of even thickness between each unit.
3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage.

D. Lift and support units only at designated points shown on Shop Drawings.

1.8 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Nitterhouse Concrete Products, Inc.; Spandeck Hollow Core

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.3 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized.

E. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

F. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

G. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

I. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain, flat sheet, Type 1 bendable coating.

J. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.4 PRESTRESSING TENDONS

A. Pretensioning Strand: ASTM A 416/A 416M, Grade 250 or Grade 270, uncoated, 7-wire, low-relaxation strand.

B. Unbonded Post-Tensioning Strand: ASTM A 416/A 416M, Grade 270, uncoated, 7-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.6 and sheath with polypropylene tendon sheathing complying with ACI 423.6. Include anchorage devices and coupler assemblies.

C. Post-Tensioning Bars: ASTM A 722, uncoated high-strength steel bar.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin Admixture: ASTM C 618, Class N.
3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate unless otherwise approved by Architect.

D. Lightweight Aggregates: Except as modified by PCI MNL 116, ASTM C 330, with absorption less than 11 percent.

E. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

G. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

H. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M.

I. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable-Iron Castings: ASTM A 47/A 47M.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 or ASTM A 490, Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563; and hardened carbon-steel washers, ASTM F 436.

1. Do not zinc coat ASTM A 490 bolts.

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

N. Welding Electrodes: Comply with AWS standards.

O. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.7 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.

B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

C. Stainless-Steel-Headed Studs: ASTM A 276, with minimum mechanical properties of PCI MNL 116.

2.8 BEARING PADS

A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D 2240; minimum tensile strength 2250 psi, ASTM D 412.

2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test 1 specimen for every 200 pads used in Project.
3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to stainless- or mild-steel plate, of type required for in-service stress.
5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.9 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
2. Limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods

according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.

F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft., plus or minus 3 lb/cu. ft., according to ASTM C 567.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

I. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.11 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.12 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting

operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Increase cover requirements according to ACI 318 when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses.

G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
5. Protect strand ends and anchorages with a minimum of 1-inch- thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.

H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

L. Comply with ACI 306.1 procedures for cold-weather concrete placement.

M. Comply with PCI MNL 116 procedures for hot-weather concrete placement.

N. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.

O. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

P. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.13 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.

2.14 COMMERCIAL FINISHES

A. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.

B. Apply roughened surface finish according to ACI 318 to precast concrete units that will receive concrete topping after installation.

2.15 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.

1. Test and inspect self-consolidating concrete according to PCI TR-6.

C. Strength of precast structural concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition or, if units will be wet under service conditions, test cores after immersion in water in a wet condition.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

a. Project identification name and number.
b. Date when tests were performed.
c. Name of precast concrete fabricator.
d. Name of concrete testing agency.
e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks,

corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to the Structural Engineer's approval. Architect reserves the right to reject precast units that are defective or do not meet these specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting, cast-in-place, building structural framing has attained minimum allowable design compressive strength or until supporting steel or other structure is complete.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of the Architect.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
4. Remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.

1. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
2. Fill joints completely without seepage to other surfaces.
3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
4. Place grout end cap or dam in voids at ends of hollow-core slabs.
5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Erection of precast structural concrete members.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.5 REPAIRS

A. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units has not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03410

SECTION 03481 - ARCHITECTURAL GLASS FIBER REINFORCED CONCRETE

PART 1 - GENERAL

SUMMARY

This Section refers to architectural glass fiber reinforced concrete (GFRC)

Architectural GFRC concrete includes the following:

GFRC as defined in the architectural plans. Potentially includes moldings or any other decorative elements to be manufactured out of GFRC.

These are non-structural, self supporting units.

SUBMITTALS

Product data and instructions for manufactured materials and products.

Shop drawings prepared by CDI showing complete information concerning the GFRC units. Indicate member dimensions and cross-section. Unless otherwise noted, anchors will be embedded in a standard configuration.

Samples - Submit samples of color options and texture options for selection process.

QUALITY ASSURANCE

Fabricator Qualifications: CDI has over 45 years of successful experience in fabrication of architectural precast concrete units and over 10 years experience in manufacturing GFRC. Fabricator has sufficient production capacity to produce, transport and deliver required units without causing delay in the work.

Design modifications will be made only as necessary to meet field conditions and to ensure proper fitting of the work and only as acceptable to Architect. Maintain general design concept shown without increasing or decreasing sizes of members or altering profiles and alignment shown without architects approval. Modifications may need to be considered in view of budget constraints.

DELIVERY, STORAGE AND HANDLING

Deliver GFRC units to project site in such quantities and at such times to assure continuity of installation. Products to be packaged to protect the finish during transport. GFRC may be a long lead time item and should be ordered accordingly.

PART 2 - PRODUCTS

REINFORCING MATERIALS

Epoxy coated rebar used in some product designs to insure safe handling.

Corrugated Wall Ties - Included in moldings as the mechanical fastener. 22 gauge mill galvanized steel - 7/8" x 7".

Threaded Inserts - Plastic inserts are included in very large castings such as large moldings, columns and stackable column components. These are for mechanical ties and not for lifting purposes.

Adhesives - Latex - modified mortar used on a stable substrate in conjunction with the mechanical fastener should be used. White cement can be used to adjust the greenish color created by using the latex mortar.

Premium grade construction adhesives which come in tubes should be used for bonding columns and on flat surfaces where latex mortar cannot be used.

CONCRETE MATERIALS

Portland Cement: Type 1 Portland Cement Gray or Lehigh White

Use only one brand, type and source of supply of cement throughout the project, unless otherwise acceptable to Architect.

Sand: Silica Sand.

Glass Fibers: Alkali resistent fiber specifically produced for use in GFRC.

Pigments: Nonfading, resistant to lime and other alkalies.

Water: Drinkable, free from foreign materials in amounts harmful to concrete and embedded steel.

Polymer Admixture: Utilize standard mix designs incorporating admixtures which facilitate the workability, curing and strength of the mix.

FABRICATION

General: Fabricate GFRC units complying with manufacturing and testing procedures, quality control recommendations, and following dimensional tolerances, unless otherwise indicated.

Molds: Accurately construct molds mortar-tight and of sufficient strength to withstand pressures due to material placing operations and temperature changes. Maintain mold work to provide completed GFRC units of shapes, lines and dimensions indicated, within specified fabrication tolerances.

Dimensional Tolerances of Finished Units: GFRC being tapered by design, is measured for length, width and thickness at the surface from which the mold is loaded maintaining plus or minus 1/16 of an inch tolerance. Overall height and width measured at face adjacent to mold at time of casting:

Surface Finish: Fabricate precast units and provide exposed surface finished as follows:

Standard GFRC - Smooth surface finish free of excessive air voids.

Color: Select from CDI color chart to minimize variations in color.

PART 3 - RECOMMENDED EXECUTION OF THE INSTALLATION - The successful installation requires experienced, knowledgeable installers in order to achieve a quality installation. Considerations for installation include:

Install GFRC members plumb, level and in alignment. Provide temporary supports and bracing as required to maintain position, stability and alignment as members are being permanently connected.

Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

Accessories: Install clips, hangers and other accessories required for erection of GFRC units to supporting members and backup materials.

Anchor units in final position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges and spacers as soon as possible after anchoring and grouting are completed.

Cleaning: Clean exposed facings to remove dirt and stains on units after erection and completion of joint treatments. Protect other work from damage due to cleaning operations. Do not use cleaning materials or processes that could change the character of exposed concrete finishes.

END OF SECTION 03481

SECTION 03542 - CEMENT-BASED UNDERLAYMENT

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 cement-based, polymer-modified, self-leveling underlayment for interior finish flooring.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer (applicator) who is acceptable to manufacturer, who has completed cement-based underlayment applications similar in material and extent to that required for this Project, and whose work has resulted in construction with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written recommendations for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

B. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

1.7 COORDINATION

A. Coordinate cement-based underlayment with requirements of finish flooring products.

1. Before installing surface sealers recommended by underlayment manufacturer, if any, verify compatibility with finish flooring installation adhesives.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the following:

1. Gypsum Cement: Gyp-Crete 2000/3.2K “Green” floor underlayment gypsum cement as manufactured by the Maxxon Corporation, Hamel, MN. All others must receive prior approval.

2. Reinforcement Mesh: Maxxon Crack Suppression Mat (CSM) or 3.4 lbs/sq. yd. galvanized metal lath.

3. Sand Aggregate: Sand shall be 1/8 inch or less, washed masonry or plaster sand, meeting requirements of Maxxon Corporation Sand Specifications 101.

4. Mix Water: Potable, free from impurities.

5. Subfloor Primer: Maxxon Floor Primer

6. Sealer: Maxxon Overspray

2.2 MIX DESIGNS

A. General Requirements: Mix proportions and methods shall be in strict accordance with product manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of underlayment including substrate moisture content. Begin underlayment application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions for substrate indicated. Provide clean, dry, neutral-pH substrate for underlayment application.

1. Treat nonmoving substrate cracks to prevent cracks from telegraphing (reflecting) through underlayment according to manufacturer's written recommendations.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond according to manufacturer's written instructions.

C. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

1. Install underlayment reinforcement recommended in writing by manufacturer.

D. Metal Substrates: Mechanically remove rust, foreign matter, and other contaminants that might impair underlayment bond according to manufacturer's written instructions. Apply corrosion-resistant coating compatible with underlayment if recommended in writing by underlayment manufacturer.

E. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond according to manufacturer's written instructions.

F. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
2. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate if required to produce smooth surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install finish flooring over underlayment until after time period recommended by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.5 APPLICATION OF CEMENTITIOUS FLOORING

A. Scheduling: Application of Gyp-Crete 2000/3.2K “Green” shall not begin until the building is enclosed, including roof, windows, doors, and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.

B. Drying: General Contractor shall provide continuous ventilation and adequate heat to rapidly remove moisture from the area until the Gyp-Crete 2000/3.2K “Green” is dry. General Contractor shall provide mechanical ventilation if necessary. Under the above conditions, for 1 inch (25 mm) thick Gyp-Crete 2000/3.2K “Green”, 7-10 days is usually adequate drying time. To test for dryness, tape a 24 inch by 24 inch (609 mm by 609 mm) section of plastic or high density rubber mat to the surface of the underlayment. After 48-72 hours, if no condensation occurs, the underlayment shall be considered dry. Perform dryness test 5-7 days after pour.

3.6 FIELD QUALITY CONTROL

G. Slump Test: If slump testing is recommended in writing by manufacturer, test underlayment for slump as it is placed for compliance with manufacturer's written recommendations.

H. Field Samples: Take at least three molded-cube samples from each underlayment batch. Test samples according to ASTM C 109/C 109M for compliance with compressive-strength requirements. When requested, provide test results to Architect.

3.7 PROTECTION

I. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03542

04720- Architectural Cast Stone

1. PART 1 - GENERAL

1.1. SECTION INCLUDES - Architectural Cast Stone.

A. Scope - All labor, materials and equipment to provide the Cast Stone shown on architectural drawings and as described in this specification.
   1. Manufacturer shall furnish Cast Stone covered by this specification.
   2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the Cast Stone as required.

1.3. REFERENCES

A. ACI 318 – Building Code Requirements for Reinforced Concrete.
B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
D. ASTM C 33 – Standard Specification for Concrete Aggregates.
E. ASTM C 150 - Standard Specification for Portland Cement.
F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
J. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units
K. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
L. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
N. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
O. ASTM C 989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
P. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
Q. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
R. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
S. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
T. Cast Stone Institute^{SM} Technical Manual (Current Edition)

1.4. DEFINITIONS

A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
   1. Dry Cast Concrete Products – manufactured from zero slump concrete.
      a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.
      b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
   2. Wet Cast Concrete Products – manufactured from measurable slump concrete.
      a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5. SUBMITTAL PROCEDURES

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.

C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.

D. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors (if required), annotation of stone types and their location.

1.6. QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.

2. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.

B. Standards: Comply with the requirements of the Cast Stone Institute^{SM} Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

C. Mock-up- Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

2. PART 2 - PRODUCTS

2.1. ARCHITECTURAL CAST STONE

A. Comply with ASTM C 1364

B. Physical properties: Provide the following:

1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.

3. Air Content – ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

4. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.

C. Job site testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m 3) delivered to the job site.

1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.

2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.

3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2. RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.

B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.

C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures- Comply with the following:

1. ASTM C 260 for air-entraining admixtures.

2. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.

3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water – Potable

G. Reinforcing bars:
1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3. COLOR AND FINISH

A. Color to be a "white", as selected by the architect from standard range of colors.

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in.^{2} (25 mm^2) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3 m) distance.
1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
a. Total color difference – not greater than 6 units.
b. Total hue difference – not greater than 2 units.

D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6 m) distance.

E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4. REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Panels, soffits and similar stones greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.

E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5. CURING

A. Cure units in a warm curing chamber approximately 100ºF (37.8ºC) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70ºF (21.1ºC) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6. MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than ±1/8 in. (3 mm) from approved dimensions.

B. Length of units shall not deviate by more than length/ 360 or ±1/8 in. (3 mm), whichever is greater, not to exceed ±1/4 in. (6 mm).
   1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
C. Warp, bow or twist of units shall not exceed length/ 360 or ±1/8 in. (3 mm), whichever is greater.
D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. (9 mm) maximum deviation.

2.7. PRODUCTION QUALITY CONTROL

A. Testing.
   1. Test compressive strength and absorption from specimens selected at random from plant production.
   2. Samples shall be taken and tested from every 500 (14 m^3) cubic feet of product produced.
   3. Perform tests in accordance ASTM C 1194 and C 1195.
   4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.8. DELIVERY, STORAGE AND HANDLING

A. Mark production units with the identification marks as shown on the shop drawings.
B. Package units and protect them from staining or damage during shipping and storage.
C. Provide an itemized list of product to support the bill of lading.

3. PART 3 EXECUTION

3.1. EXAMINATION

A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2. SETTING TOLERANCES

A. Comply with Cast Stone Institute^{SM} Technical Manual.
B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.
C. Joints, plus - 1/16 in. (1.5 mm), minus - 1/8 in. (3 mm).

3.3. JOINTING

A. Joint size:
   1. At stone/brick joints 3/8 in. (9.5 cm).
   2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
   3. Stone/stone joints exposed on top 3/8 in. (9.5 mm).
B. Joint materials:
   1. Mortar, Type N, ASTM C 270.
   2. Use a full bed of mortar at all bed joints.
   3. Flush vertical joints full with mortar.
   4. Leave all joints with exposed tops or under relieving angles open for sealant.
   5. Leave head joints in copings and projecting components open for sealant.
C. Location of joints:
   1. As shown on shop drawings.
   2. At control and expansion joints unless otherwise shown.

3.4. SETTING

A. Drench units with clean water prior to setting.
B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
C. Set units in full bed of mortar, unless otherwise detailed.
D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.
E. Remove excess mortar from unit faces immediately after setting.

F. Tuck point unit joints to a slight concave profile.

3.5. JOINT PROTECTION

A. Comply with requirements of Section 07920.
B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6. REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.
B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
C. Consult with manufacturer for appropriate cleaners.

3.7. INSPECTION AND ACCEPTANCE

A. Inspect finished installation according to Bulletin #36.
B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units
2. Face brick
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Related Sections include the following:
1. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.

C. Products furnished, but not installed, under this Section include the following:
1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."

D. Products installed, but not furnished, under this Section include the following:
1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
   2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless indicated as bullnose.

B. Concrete Masonry Units: **ASTM C 90** and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **1900 psi (13.1 MPa)**.
2. Weight Classification: **Lightweight, unless otherwise indicated**.
3. Provide Type II, nonmoisture-controlled units.
4. Size (Width): Manufactured to the following dimensions:

a. 4 inches (102 mm) nominal; 3-5/8 inches (92 mm) actual.

b. 6 inches (152 mm) nominal; 5-5/8 inches (143 mm) actual.
c. 8 inches (203 mm) nominal; 7-5/8 inches (194 mm) actual.
d. 10 inches (254 mm) nominal; 9-5/8 inches (244 mm) actual.
e. 12 inches (305 mm) nominal; 11-5/8 inches (295 mm) actual.

5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
   a. Where units are to be left exposed, provide color and texture matching the range represented by Architect's sample.

2.2 BRICK

A. General: A very limited amount of brick will be required for patching and repair of the original 1879 building. In such places, the brick shall be a modular size, with general texture to match the existing, and shall be painted to match the existing paint color.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: **ASTM C 207**, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. Mortar Cement: **ASTM C 1329**.

E. Masonry Cement: **ASTM C 91**.

1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.

   a. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
   b. Pigments shall not exceed 5 percent of **mortar cement or masonry cement** by weight for mineral oxides nor 1 percent for carbon black.

F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

K. Water: Potable.

L. Products: Subject to compliance with requirements, provide one of the following:

1. Colored Portland Cement-Lime Mix:
   a. Color Mortar Blend; Glen-Gery Corporation.
   b. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
   c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
   d. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).

2. Cold-Weather Admixture:

   a. Accelguard 80; Euclid Chemical Co.
   b. Morseled; W. R. Grace & Co., Construction Products Division.
   c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.

2.4 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

A. General: **ASTM A 951** and as follows:
   1. Hot-dip galvanized, carbon-steel wire for exterior walls.
   2. Wire Size for Side Rods: **W1.7 or 0.148-inch (3.8-mm)** diameter.
   3. Wire Size for Cross Rods: **W1.7 or 0.148-inch (3.8-mm)** diameter.
   4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.

C. For multiwythe masonry, provide types as follows:

1. Ladder type with perpendicular cross rods spaced not more than 16 inches (407 mm) o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 1 side rod for each wythe of masonry 4 inches (100 mm) or less in width.

2.6 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches (100 mm) wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches (32 mm).

B. Wire: Fabricate from **3/16-inch- (4.8-mm-)** diameter, **hot-dip galvanized steel** wire.
1. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, bent in manner indicated.

B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.
2. Type: Expansion anchors.
3. Type: Undercut anchors.
4. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
5. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
6. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.9 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Manufacturer's standard laminated flashing of type indicated below:

1. Copper-Fabric Laminate: Copper sheet of weight indicated below, bonded with asphalt between 2 layers of glass-fiber cloth. Use under roof copings, over door and window heads, under sills, and at through-wall masonry, applications, as shown on the drawings.

   a. Weight: 7 oz./sq. ft. (2 kg/sq. m).

2. Application: Use where flashing is fully concealed in masonry.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following

1. Copper-Fabric Laminate Flashing:

   a. Copper Fabric; AFCO Products, Inc.
   b. Type FCC-Fabric Covered Copper; Phoenix Building Products.
   c. Copper Fabric Flashing; Sandell Manufacturing Co., Inc.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material.

1. Neoprene.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Greenstreak No. 673 masonry control joint or approved equivalent.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep Holes: Provide the following:

1. Wicking Material: Material as indicated below, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity between wythes:

   a. Fibrous glass rope.

E. Cavity Drainage Material: minimum **3/4-inch-** thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

2.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with **ASTM C 270**, Proportion Specification.

D. Mortar for Unit Masonry: Comply with **ASTM C 270**, Property Specification.
1. Limit cementitious materials in mortar for exterior **and reinforced** masonry to portland cement, mortar cement, and lime.
2. For masonry below grade, in contact with earth, and where indicated, use Type **S**.
3. For reinforced masonry and where indicated, use Type **S**.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls, and for other applications where another type is not indicated, use Type **N**.

E. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:

1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
2. For mineral-oxide pigments and **masonry cement or mortar cement** mortar, not more than 5 percent.

F. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.

1. Mix to match Architect's sample.

G. Grout for Unit Masonry: Comply with **ASTM C 476**.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with **Table 5 of ACI 530.1/ASCE 6/TMS 602** for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
   1. Running Bond. Align with existing courses.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

   1. With full mortar coverage on horizontal and vertical face shells.
   2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

3.6 BONDING OF MULTIWYTHE MASONRY

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie every **16 inches** o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

B. Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than **16 inches** o.c.

3.7 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction

3.8 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

3.10 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to **wall framing and/or concrete and masonry backup** with **seismic** masonry-veneer anchors to comply with the following requirements:
1. Fasten anchors **through sheathing to wall framing, or to concrete and masonry backup** with metal fasteners of type indicated.
2. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and **32 inches (813 mm)** o.c. horizontally with not less than 1 anchor for each [**3.5 sq. ft. (0.33 sq. m)**] of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated or as required by good practice. Review proposed joint locations with Architect prior to construction. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:
1. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.

C. Form expansion joints in brick made from clay or shale as follows:
1. Build in joint fillers where indicated.
2. Form open joint of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.

3.12 LINTELS

A. Install steel lintels where indicated, or as required.

B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 **inches**, and through inner wythe to within 1/2 inch (13 mm) of the interior face of the wall in exposed masonry.
2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches (200 mm), and behind air-infiltration barrier or building paper.
3. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn flashing up not less than 2 inches (50 mm) to form a pan.
4. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13 mm) back from outside face of wall and adhere flashing to top of metal flashing termination.
5. Cut flashing off flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Use **wicking material** to form weep holes.
2. Use wicking material to form weep holes above flashing in sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches (600 mm) o.c..
4. Place cavity drainage material **immediately above flashing in cavities**.

3.14 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.

3.16 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 04860 - STONE VENEER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes stone veneer in the following applications:
   1. **Anchored** to unit masonry, structural steel and steel stud backup.

B. Related Sections include the following:
   1. Division 4 Section "Unit Masonry Assemblies" for concealed flashing, horizontal joint reinforcement, and veneer anchors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

   1. For stone varieties proposed for use on Project, include data on physical properties **specified** and/**or required by referenced ASTM standards**.

B. Stone Samples for Verification: For each color, grade, finish, and variety of stone required.

C. Colored Mortar Samples for Verification: For each color required.

D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, sources of supply, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

   1. Submittal is for information only. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

E. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.

B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.

1. Obtain each variety of stone from a single quarry, whether specified in this Section or in another Section of the Specifications.

C. Source Limitations for Mortar Materials: Obtain ingredients of a uniform quality for each mortar component from a single manufacturer and each aggregate from one source or producer.

D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup.

2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone veneer assemblies when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone veneer assemblies.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace stone veneer assemblies damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in **ACI 530.1/ASCE 6/TMS 602**.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 STONE

A. **Virginia Limestone, Edinburg, Lincolnshire or New Market formation**

B. **Pennsylvania Bluestone (Type II, Quartzite Sandstone)**.

C. Pattern and cut – **Random coursed ashlar** (generally to match the color and character of the adjacent Municipal Building)

D. <u>Minimum performance and properties of the stone:</u>
- Absorption – 1.04% (ASTM C-97)
- Specific gravity – 161 pcf
- Modulus of Rupture – 10,200 psi, parallel to bed, 2650 psi perpendicular to bed (ASTM C-99)
- Compressive Strength, Dry Condition - 10,000 psi parallel to bed, 16,000 psi perp. to bed (ASTM C-170)
- Compressive Strength, Wet Condition – 10,000 psi parallel to bed, 12,000 psi perp. to bed

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: **ASTM C 207**, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.

D. Mortar Cement: **ASTM C 1329**.

E. Masonry Cement: **ASTM C 91**.

F. For pigmented mortar, use a colored cement formulation as required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations.

1. Pigments shall be composed of natural or synthetic iron oxides, compounded for use in mortar mixes, and with a record of satisfactory performance in stone masonry mortars.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of **mortar cement or masonry cement** by weight.
4. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.

G. Aggregate: ASTM C 144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

I. Water: Potable.

J. Products:

1. Colored Portland Cement-Lime Mix:

a. Blue Circle Cement; Eaglebond.
b. Glen-Gery Corporation; Color Mortar Blend.
c. Holnam, Inc.; Rainbow Mortamix Custom Color Cement/Lime.
d. Lafarge Corporation; Centurion Colorbond PL.
e. Lehigh Portland Cement Co.; Lehigh Custom Color Portland/Lime.
f. Riverton Corporation (The); Riverton Portland Cement Lime Custom Color.

2. Mortar Cement:

   a. Blue Circle Cement; Magnolia Superbond Mortar Cement.
   b. Lafarge Corporation; Lafarge Mortar Cement.

3. Colored Mortar Cement:

   a. Blue Circle Cement; Magnolia Superbond Mortar Cement.

4. Colored Masonry Cement:

   a. Blue Circle Cement; Magnolia Masonry Cement.
   b. Essroc Materials, Inc.; Brixment-in-Color.
   c. Holnam, Inc.; Rainbow Mortamix Custom Color Masonry Cement.
   d. Lafarge Corporation; Centurion Colorbond.
   e. Lehigh Portland Cement Co.; Lehigh Custom Color Masonry Cement.
   f. National Cement Company, Inc.; Coosa Masonry Cement.
   g. Riverton Corporation (The); Flamingo Color Masonry Cement.
   h. Southdown, Inc.; Richcolor Masonry Cement.

5. Mortar Pigments:

   a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
   b. Davis Colors; True Tone Mortar Colors.
   c. Lafarge Corporation; Centurion Pigments.
   d. Solomon Colors; SGS Mortar Colors.

6. Cold-Weather Admixture:

   a. Euclid Chemical Co.; Accelguard 80.
   b. Grace, W. R. & Co., Construction Products Division; Morset.
   c. Sonneborn, Div. of ChemRex, Inc.; Trimix-NCA.

2.3 VENEER ANCHORS

A. Materials:

   1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.

B. Corrugated-Metal Veneer Anchors: Not less than 0.030-inch- (0.76-mm-) thick by 7/8-inch- (22-mm-) wide **hot-dip galvanized steel** sheet with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 13 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm).

C. Wire Veneer Anchors: Formed from W1.7 or 0.148-inch- (3.8-mm-) diameter, **hot-dip galvanized steel** wire.

2.4 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

1. Fabricate through-wall metal flashing embedded in masonry with **sawtooth or dovetail** ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.
2. Fabricate metal expansion-joint strips to shape indicated.
3. Fabricate metal drip edges to extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with a hemmed outer edge bent down 30 degrees.
4. Fabricate metal flashing terminations to extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and then down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.

B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use **one of** the following, unless otherwise indicated:

1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of **5-oz./sq. ft. (1.5-kg/sq. m)** sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

E. Products:

1. Metal Flashing:

a. Cheney Flashing Company; Cheney Flashing (Dovetail).
b. Cheney Flashing Company; Cheney Flashing (Sawtooth).
c. Keystone Flashing Co.; Keystone 3-Way Interlocking Thruwall Flashing.

2. Copper-Laminated Flashing:

a. Advanced Building Products, Inc.; Copper Fabric Flashing.
b. AFCO Products, Inc.; Copper Fabric.
c. Polytite Manufacturing Corp.; Copper Fabric Flashing.
d. Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
e. York Manufacturing, Inc.; York Copper Fabric Flashing.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from **urethane or PVC**.

B. Weep Holes:

1. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity behind stone veneer assembly.

2.6 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry-measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.

2.7 STONE FABRICATION

A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
   1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

B. **Select** stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.

   1. Clean sawed backs of stone to remove rust stains and iron particles.

C. Gage backs of stones for adhered veneer if more than 81 sq. in. in area.

D. Thickness of Stone Veneer: Provide thickness indicated, but not less than the following:

   1. Thickness: 6 inches and 8inches (as shown on Drawings) plus or minus **1/2 inch.**

E. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.

F. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

2.8 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

   1. Do not use calcium chloride.
   2. Add cold-weather admixture (if used) at same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
   3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Mortar for Stone Masonry: Comply with **ASTM C 270**, Proportion Specification.

C. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.

D. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.

E. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Mix to match Architect's sample.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of **mortar cement or masonry cement** by weight.

F. Colored-Aggregate Mortar: Produce color required by combining colored aggregates with cementitious materials of selected color.

1. Provide samples to Architect for color selection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone veneer assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in unit masonry or concrete and required for or extending into stone veneer assemblies are correctly installed.
2. Examine wall framing, sheathing, and building paper or building wrap to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone veneer assemblies.

B. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.

C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING OF STONE VENEER, GENERAL

A. Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones for good fit in **random coursed Ashlar** pattern with joint widths within tolerances indicated. Produce joints as uniform in width as practical.

D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

E. Set stone to comply with requirements indicated on Drawings. Install veneer anchors, supports, fasteners, and other attachments indicated or necessary to secure stone veneer assemblies in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than **3/8 inch (10 mm)** at narrowest points nor more than **1 inch (25 mm)** at widest points.

G. Provide expansion, control, and pressure-relieving joints of widths and at locations required by good practice.

1. Keep expansion and pressure-relieving joints free of mortar and other rigid materials.
2. Sealing expansion, control, and pressure-relieving joints is specified in Division 7 Section "Joint Sealants."

H. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.
2. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13 mm) back from outside face of wall and adhere flashing to top of metal drip edge.
3. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13 mm) back from outside face of wall and adhere flashing to top of metal flashing termination.
4. Cut flashing flush with face of wall after masonry wall construction is completed.

I. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

1. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
2. Space weep holes formed from **wicking material** 24 inches (400 mm) o.c.
3. In cavities, place pea gravel to a height of 2 inches (50 mm) above top of flashing embedded in the wall, as masonry construction progresses.

4. Place cavity drainage material **immediately above flashing in cavities**.

J. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or more.

B. Variation from Level: For **bed joints and** lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

G. Variation in Plane on Face of Individual Stone: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

A. Anchor stone veneer to unit masonry with metal veneer anchors as follows:

1. Embed corrugated-metal anchors in unit masonry mortar joints or grouted cells for distance at least one-half of veneer thickness.
2. Secure triangular wire anchors with vertical rods inserted through anchors and through eyes of masonry wall reinforcement projecting from horizontal mortar joints.
3. Embed anchors in veneer mortar joints to within 1 inch (25 mm) of face.
4. Bend ends of wire anchors at right angles to form hooks not less than 2 inches (50 mm) long.

B. Space veneer anchors not more than 16 inches (400 mm) o.c. vertically and 24 inches (600 mm) o.c. horizontally. Install additional veneer anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).

C. Set stone in full bed of mortar with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.

1. Install continuous wire reinforcement in horizontal joints indicated and attach to seismic veneer anchors as stone is set.

3.6 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: **Smooth, flat face recessed 1/4 inch (6 mm) below edges of stone (raked joint)**.

3.7 ADJUSTING AND CLEANING

A. Remove and replace stone veneer assemblies of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Stone veneer assemblies not matching approved samples and mockups.
4. Stone veneer assemblies not complying with other requirements indicated.

B. Replace in a manner that results in stone veneer assemblies' matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone veneer assemblies.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

3.8 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

END OF SECTION 04860

SECTION 05120 - STRUCTURAL STEEL

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. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.

1.3 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Shop primers.
4. Nonshrink grout.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Seismic Provisions for Structural Steel Buildings".
2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
3. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, platforms, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

G. Anchor Rods, Bolts, Nuts, Washers: As follows:

1. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.
2. Finish: Plain, uncoated.
3. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.

4. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
5. Finish: Plain, uncoated.
6. Finish: Hot-dip zinc-coating, ASTM A 153, Class C.
7. Washers: ASTM A 36 (ASTM A 36M).

2.2 PRIMER

A. Primer: SSPC-Paint 25, red iron oxide, zinc oxide, raw linseed oil, and alkyd.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds and repair painting galvanizing steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Pint 20.

2.3 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

D. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
2. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces. Grind butt welds flush. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.6 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning." (interior steel)
2. SSPC-SP 3, "Power Tool Cleaning." (exterior steel)

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.7 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this section.

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
2. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC specifications referenced in this section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Grind butt welds flush. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Open-web K-series steel joists.
2. Joist accessories.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Division 4 Section "Unit Masonry Assemblies" for installing bearing plates in unit masonry.
3. Division 5 Section "Metal Fabrications" for furnishing steel bearing plates.
4. Division 9 Section "Painting" for prime painting.

1.3 DEFINITIONS

A. Special Joists: Joists requiring modification by the manufacturer to support nonuniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads within limits and under conditions indicated.

B. Design joists to withstand design loads with **total** load deflections no greater than the following:

1. Floor Joists: Vertical deflection of **1/360** of the span.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated.

B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.

1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
3. Professional Engineer Qualifications: A professional engineer who is legally authorized 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 joists that are similar to those indicated for this Project in material, design, and extent.

B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for chord and web members.

B. Steel Bearing Plates: ASTM A 36/A 36M.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: **Plain, uncoated**.

D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: **Plain, uncoated**.

E. Welding Electrodes: Comply with AWS standards.

F. Galvanizing Repair Paint: **ASTM A 780**.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, Type I, red oxide; FS TT-P-636, red oxide; or manufacturer's standard shop primer complying with performance requirements of either of these red-oxide primers.

2.3 OPEN-WEB K-SERIES STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord; of joist type indicated.

1. Joist Type: **K-series steel joists**.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Do not camber joists.

G. Camber joists **according to SJI's "Specifications."**

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.

B. Bridging: Fabricate as indicated and according to SJI's "Specifications."

1. Furnish additional erection bridging if required.

C. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. **Shop prime paint**.

D. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."

E. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.

F. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by **hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3**.

B. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

C. Painting of joists and joist accessories is specified in Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's **"Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts"** for high-strength structural bolt installation and tightening requirements.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect **field welds and high-strength bolted connections**.

B. Field welds will be visually inspected according to AWS D1.1.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following procedures, as applicable:

1. Radiographic Testing: ASTM E 94 and ASTM E 142.
2. Magnetic Particle Inspection: ASTM E 709.
3. Ultrasonic Testing: ASTM E 164.
4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's **"Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."**

E. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.

F. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories**, bearing plates and abutting structural steel**.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.

B. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop-welded shear connectors.
2. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
3. Division 9 Section "Painting" for repair painting of painted deck.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

E. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

   a. BHP Steel Building Products USA Inc.
   b. Consolidated Systems, Inc.
   c. Epic Metals Corp.
   d. Marlyn Steel Products, Inc.
   e. Nucor Corp.; Vulcraft Div.
   f. Roof Deck, Inc.
   g. United Steel Deck, Inc.
   h. Verco Manufacturing Co.
   i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), **G60** zinc coating.
   2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
   3. Deck Profile: **Type WR, wide rib**.

4. Profile Depth: **1-1/2 inches (38 mm**.
5. Span Condition: **As indicated on drawings**.
6. Side Laps: **Overlapped or interlocking seam at Contractor's option**.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8 mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, **0.0598 inch** thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

H. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

I. Galvanizing Repair Paint: **ASTM A 780**.

J. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows:

1. Weld Diameter: **5/8 inch (16 mm**, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds **12 inches (305 mm) apart in the field of the roof and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions of FM Loss Prevention Data Sheet 1-28**.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or **36 inches (910 mm)**, and as follows:

1. Mechanically fasten with self-drilling No. 10 (4.8-mm-) diameter or larger carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: **Lapped 2 inches minimum or butted at Contractor's option**.

D. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:

1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on **both surfaces** of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9.

C. Repair Painting: Wire brushing, cleaning and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

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. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for shelf angles and connections.
2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
3. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
d. deflection of 1/240 1/360 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Unused

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
   2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.
21. The Steel Network, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90 or equivalent on all exterior studs.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch
2. Flange Width: 1-5/8 inches.
3. Section Properties: As required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 2 inches.
3. Section Properties: As required by structural performance.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B 695, Class 50.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: 24 inches.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of miscellaneous metal work is shown on drawings and includes items fabricated from iron, steel and aluminum shapes, plates, bars, strips, tubes, pipes, castings, structural steel beams and columns. This section may include miscellaneous structural items.

1.3 QUALITY ASSURANCE

A. Take field measurements prior to preparation of shop drawings and fabrication where possible. Do not delay job progress; allow for trimming and fitting whenever taking field measurements before fabrication might delay work. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTALS

A. Manufacturer's Data: For information only, submit two copies of manufacturer's specifications, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products. Indicate by transmittal that copy of instructions has been distributed to installer.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others. Submit an extra blueline for structural engineer.

C. Samples: Submit two sets of representative samples of materials and finished products as may be requested by architect. Architect's review will be for color, texture, style, and finish only; all other requirements are contractor's responsibility.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam marks, oil canning, staining, discoloration, roller marks, rolled trade names, and roughness. Any such imperfection will be cause for rejection. These requirements do not apply to concealed or structural members which shall meet ASTM A-36, 36,000 psi yield.

B. Steel Plates, Shapes and Bars: ASTM A-36.

C. Steel Plates to be Bent or Cold-Formed: ASTM A-283, Grade C.

D. Steel Tubing: Hot-formed, welded, or seamless, ASTM -A-501; Structural Pipe, ASTM A-53.

E. Steel Bars and Bar Size Shapes: ASTM A-306, Grade 65, or ASTM A-36.

F. Cold Finished Steel Bars: ASTM A-108, grade as selected by fabricator.

G. Steel Pipe: ASTM A-53 type as selected, Grade A, black finish, unless galvanizing is required; standard weight (Schedule 40), unless otherwise indicated.

H. Steel angles: ASTM A-36.

I. Aluminum: Comply with the following standards for forms and types of aluminum for required items of work. Provide alloy and temper as shown or specified, or as otherwise recommended by aluminum producer or finisher.

J. Concrete Inserts: Threaded or wedge type galvanized ferrous castings, either malleable iron ASTM A-A47, or cast steel ASTM A-27. Provide bolts, washers and shims as required, hot-dipped galvanized, ASTM A-153.

K. Non-Shrink Non-Ferrous Grout: CE CRD C-588.

L. FASTENERS: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

M. Bolts and Nuts: Regular hexagon head type, ASTM A-307, Grade A.

N. Lag Bolts: Square head type, FS FF-B--561.

O. Machine Screws: Cadmium plated steel, FS FF-S-92.

P. Wood Screws: Flat head carbon steel, FS FF-S-111

Q. Plain Washers: Round carbon steel, FS FF-W-92.

R. Toggle Bolts: Tumble wing type, FS FF-B-588, type, class and style as required.

S. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

T. PAINT: Interior primer shall be Red Lead mixed pigment, alkyd varnish, linseed oil paint, FS-TT-P-86, Type II or Red Lead Iron Oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council Paint 2-64; or Basic Lead Silico Chromate Base Iron Oxide, linseed oil, alkyd paint, FS TT-P-614, Type II. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9. Primer exposed to dampness or used for exterior, shall be Tnemec 99-G.

U. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specifications MIL-P-2103 (ships).

2.2 GENERAL FABRICATION

A. Workmanship: Use materials of size and thickness shown, or if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimension shown or accepted on shop drawings using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining

surfaces.

C. Form exposed connections with hairline joints flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or if not shown, Phillips flat-head countersunk screws or bolts. Provide for anchorage of type shown coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

D. Galvanizing: Provide a zinc-coating for those items shown or specified to be galvanized as follows:

1. ASTM A-153 for galvanizing iron and steel hardware.
2. ASTM A-123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8" thick or heavier.
3. ASTM A-386 for galvanizing assembled steel products.

E. Shop Painting: Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry surfaces and edges to be field welded, and galvanized surfaces unless otherwise specified.

F. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 Hand Tool Cleaning, or SSPC SP-3 Power Tool Cleaning, or SSPC - SP-7 Brush0Off Blast Cleaning. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 Solvent Cleaning.

G. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods, which will result in full coverage of joints, corners, edges and exposed surfaces. Apply one shop coat to fabricated metal items, except apply two coats to surfaces inaccessible after assembly or erection. Change color of 2nd coat to distinguish it from the 1st coat. No runs, loose spots or holidays will be allowed in any exposed work.

2.3 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware: Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Miscellaneous Framing and Supports: Provide miscellaneous steel framing and supports which constitutes the structural steel framework and ceiling tracks for supporting equipment as required to complete work. Fabricate miscellaneous units to sizes, shapes and profiles shown, or if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate all miscellaneous work from structural steel shapes and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise shown, space anchors 24" o.c. and provide minimum anchors units of 1 1/4" x 1/4" x 1/8" steel straps. Galvanized miscellaneous frames where indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which miscellaneous metal items are to be installed and notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION

A. Furnish setting drawings, diagrams, templates, instructions and directions of anchorages, such as concrete insets, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 INSTALLATION

A. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials and roughen to improve bond to surfaces. Clean bottom surfaces of bearing plates. Set loose leveling and bearing plates on wedges or other adjustable devices. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade surfaces of aluminum or exterior units, which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections. All bolted connections shall be tight with heads neatly aligned.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work. Grind all exposed welds smooth, as called for herein on shop fabrication.

E. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop painting on exposed miscellaneous metal is specified in Division 9.

END SECTION 05500

SECTION 05511 - METAL STAIRS

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. Preassembled steel stairs with concrete-filled treads.
2. Handrails and railings attached to metal stairs.
3. Handrails attached to walls adjacent to metal stairs.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Division 5 Section "Pipe and Tube Railings" for pipe and tube handrails and railings.
3. Division 5 Section "Pipe and Tube Railings" for pipe and tube handrails and railings not attached to metal stairs or to walls adjacent to metal stairs.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.

1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m) or a concentrated load of 300 lbf (1.33 kN) on an area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.

b. Uniform load of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
b. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guards.

1.4 SUBMITTALS

A. Product Data: For metal stairs and the following:

1. Prefilled metal-pan stair treads.
2. Nonslip aggregates and nonslip-aggregate finishes.
3. Paint products.
4. Grout.

B. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.

B. 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 metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

C. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 COORDINATION

A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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. Preassembled Stairs:

a. Alfab, Inc.
b. American Metal Works, Inc.
c. American Stair Corp., Inc.
d. Florida Stairs & Rails, Inc.
e. National Stair & Rail, Inc.
f. Sharon Companies, Ltd. (The).

2.2 FERROUS METALS

A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

E. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.

F. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.

G. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial quality or structural quality, Grade 33 (Grade 230), unless another grade is required for design loads.

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

D. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

E. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

F. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.4 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664, selected for good resistance

to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless higher strengths are indicated.

B. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Welded Wire Fabric: ASTM A 185, 6 by 6 inches (152 by 152 mm)--W1.4 by W1.4, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.8 STEEL-FRAMED STAIRS

A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

1. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch (1.7 mm).

1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
2. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
3. Steel Sheet: Galvanized steel sheet, where indicated.
4. Directly weld metal pans to stringers; locate welds on side of subtreads to be concealed by concrete fill. Do not weld risers to stringers.
5. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
6. Shape metal pans to include nosing integral with riser.
7. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
8. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

a. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

C. Formed-Metal Risers, Treads, and Platforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0966 inch (2.5 mm).

1. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish. Provide material with coefficient of friction of 0.6 or higher when tested according to ASTM C 1028.

2.9 STAIR HANDRAILS AND RAILINGS

A. General: Comply with applicable requirements in Division 5 Section "Pipe and Tube Railings" for handrails and railings, and as follows:

2.10 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch (0.76 mm) thick and heavier.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:

1. Exteriors (SSPC Zone 1B): SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."

E. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Do not apply primer to galvanized surfaces.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.

2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with predrilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
4. For hollow masonry anchorage, use toggle bolts.
5. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05511

SECTION 05720 Structural Glass Railing System

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and/or install glass supported railings, glass and components.

1.02 REFERENCE

A. American National Standards Institute (ANSI)

1. A17.1 Accessible and Usable Buildings and Facilities.
2. A21.l Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
3. A58.l Minimum Design Loads in Buildings and Other Structures.
4. Z97.l Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings**.**

B. American Society for Testing and Materials (ASTM)

1. A555 - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods.
2. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. C1048 - Standard Specification for Heat-Treated Flat Glass - Hind HS, Kind FT Coated and Uncoated Glass.
4. E 894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
5. E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
6. E 985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. Americans with Disabilities Act Accessibility Guidelines (ADA).

D. National Association of Architectural Metal Manufacturers (NAAMM)

1. Metal Finishes Manual.
2. Pipe Railing Manual.
3. Stair Manual.

1.03 STRUCTURAL REQUIREMENTS

A. Handrail, wall rail and Guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds applied horizontally or vertically down at

any point on the top rail. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail. Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (pound per foot) (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. [Product Data]: Manufacturer to submit approval drawings to include the following:

1. Section-thru details.
2. Mounting methods.
3. Typical Elevations.
4. Key plan layouts

C. Shop Drawings: Drawings showing fabrication and installation of handrails including plans, elevations, sections, details of components, anchor details, and attachment to adjoining units of work.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer. Railings shall be model “Tivoli”, as manufactured by Architectural Railings & Grilles, Inc.; 2031 Carolina Place Dr., Fort Mill, SC 29708. ASD. Tel: (704)365-5152. Fax: (704) 373-2995. Email: sales@stainless-railing.com. Web: http://www.stainless-railing.com.

B. Equivalent products will be considered, upon submittal of detailed drawings, specifications, and a line by line comparison of materials, finishes, fabrication, quality control and installation methods, with the proposed product with the product listed above

1.06 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 on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending. Store material in a clean, dry location away from uncured concrete and masonry. Any protection on the railings during transportation should remain until installed.

C. Keep handling on site to a minimum. Exercise caution to avoid damage to finishes of material.

1.07 PROJECT CONDITIONS

A. 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.

B. 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

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Architectural Railings & Grilles, Inc.; 2031 Carolina Place Drive, Fort Mill, SC 29708. ASD. Tel: (704)365-5152. Fax: (704) 373-2995. Email: sales@stainless-railing.com. Web: http://www.stainless-railing.com.

2.02 MATERIALS AND FINISHES

Materials

A. Base Shoe:
1. Solid aluminum extrusion
2. Overall Size: As detailed on drawings
3. Model #: As appropriate for glass thickness specified
4. Complete with required setting blocks, fillers, and gaskets

B. Glass:
1. 1/2” thick clear, tempered with beveled edges and all exposed edges ground smooth and polished

C. Glass Cap: No cap (just glass)

D. Glass-Mounted Grip Rail:
1. Provide where indicated
2. **Wood**, 1 ½” O.D. Provide on the glass guardrail, as well as on stair walls, where indicated.

Finishes

A. Stainless Steel- Directional satin (#4)

2.03 FASTENERS

A. All mechanical fasteners used shall be manufactured from stainless steel.

2.04 FABRICATION

A. All mitered and welded corners shall be ground smooth to match finish.

B. Make exposed joints butt tight and flush.

C. Interior sleeves shall be used for typical splices.

D. Fasteners are allowed at splice connection.

E. Verify dimensions on site prior to shop fabrication.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate rail setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. These include items 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. Clean debris and dust from surface area thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's drawings and direction.

B. Fit exposed connections accurately together to form tight joints except as necessary for expansion.

C. Perform cutting, drilling, and fitting required for installation of handrails. Accurately set handrails in location, alignment, and elevation, measured from established lines and levels.

D. Set posts plumb within a tolerance of 1/8 inch (3 mm).

E. When fastening to in-place construction, provide anchorage devices and fittings to properly secure rail to in-place construction. Examples of such devices include threaded fittings (for concrete inserts), toggle bolts and through-bolts. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

3.02 PROTECTION

A. Upon delivery railing may have protective wrapping. At completion of railing installation, immediately remove any protective wrapping and clean all work for inspection and approval.

B. After installation, General Contractor or Owner shall be responsible for protection of railings during the balance of construction.

C. When cleaning stainless steel surfaces use plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals shall be used

END OF SECTION

SECTION 05730 STEEL FENCING

****

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Welded steel fencing panels fabricated with galvanized flat bars and round rods welded into, modular, open grille fencing panels including steel fence posts and gates. **Fencing to be installed around the Mechanical Yard, as shown on the drawings.**

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36 - Structural Steel.

2. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.

3. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

5. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

6. ASTM D822 - Tests on Paint and Related Coatings Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.

7. ASTM D1794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

8. ASTM D3363 - Test Method for Film Hardness by Pencil Test.

1.3 SUBMITTALS

A. Provide in accordance with Section 01300 - Submittal Procedures:

1. Product data for components and accessories.

2. Shop drawings showing layout, dimensions, spacing of components and anchorage and installation details.

3. Sample: [8 by 10 inches] [203 by 254 mm] minimum size sample of fence panel illustrating design, fabrication workmanship, and selected color coating.

1.4 WARRANTY

A. 20 years warranty for factory finish against cracking, peeling, and blistering under normal use.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Ametco® Manufacturing Corporation, or approved equivalent

2.2 MATERIALS

A. Steel bar stock: ASTM A36.

B. Steel tubing: ASTM A500, Grade B.

C. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives.

2.3 FENCE SYSTEM

A. Type: Steel fencing system consisting of modular open grille fencing panels fabricated by welding flat steel bars and rods, supported by steel posts and gates and gate hardware; Ametco® Fence System as manufactured by Ametco® Manufacturing Corporation.

B. Fence panels: Fabricated from galvanized steel rods, flat bars, [round tube and louvers] welded to form an open grille pattern; Shadow® as manufactured by Ametco® Manufacturing Corporation.

1. Horizontal fixed louver bars: Formed louver shaped bars, 1-31/32 by 1/16 inch, spaced at 1-13/16 inch. Extend louver flange to allow 80 percent direct visual screening.

2. Cross rods: 5/32 inchdiameter rods welded perpendicular to back side of louver bars and spaced at 5-7/32 inches

3. Perimeter side support bars: 2 by 1/4 inch flat bars.

4. Panel height: 60 inches

5. Panel width: 64-21/32 inches.

C. Posts: Galvanized square steel tubes.

1. Size: 4 by 4 inches

2. Weld flat steel bar top caps to tubular posts.

2.4 GATES

A. Provide gates of type and size indicated on Drawings. Equip gates with manufacturer's standard hardware as required for complete functional operation.

B. Type: Hinged swinging double gate.

1. Construction: Welded frame fabricated from steel tubing with open grille steel panels to match fencing material.

2. Nominal size: 8 feet wide by 5 feet high.

3. Hardware:

a. Hinges: Size and type as determined by manufacturer. Provide 2 hinges for each leaf

b. For double gates provide padlockable, 5/8 inchdiameter center cane bolt assembly and strike.

2.5 FACTORY FINISH

A. Steel fence panels and posts shall be hot-dip galvanized to 1.25 ounces per square foot minimum zinc coating in accordance with ASTM A123. Standard size components shall receive polyester powder coating. Large gate panels shall be coated with 2-part polyurethane coating.

B. Polyester powder coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to metal substrate.

4. Minimum hardness measured in accordance with ASTM D3363: 2H.

5. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.

6. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than [3/16 inch] [5 mm] undercutting.

7. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

C. Polyurethane coating: 1.0 mil dry film thickness of coating of steel test panel cured 30 minutes at 180 degree F and aged 14 days shall resist the following test conditions without failure:

1. 5 percent salt spray for 500 hours.

2. 100 percent relative humidity for 1000 hours.

3. Water immersion for 100 hours.

4. 20 double rubs with cloth saturated with either lacquer thinner, acetone, MEK, gasoline, xylene.

5. Exposure to lubricating oils, hydraulic fluids, and cutting oils.

6. 16 cycles of 24 hours at 100 percent humidity, 24 hours at 10 degrees F, and 24 hours at 77 degrees F.

7. Hardness: H to 2H.

8. Flexibility: [1/8 inch] [3 mm] conical mandrel.

D. Color: Silver with weather resistant clear coating, as manufactured by Ametco® Manufacturing Company.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to fabrication, field verify required dimensions.

B. Cast concrete footings in accordance with Section 03300 - Cast-in-Place Concrete.

1. Minimum footing diameter:

a. Terminal and gate posts: 12 inches.

b. Intermediate line posts: 10 inches.

2. Allow 18 inches minimum embedment of posts.

3. Allow 6 inches minimum concrete beneath post bottom.

3.2 INSTALLATION

A. Install fencing in accordance with manufacturer's installation instructions and approved shop drawings.

B. Install fence posts plumb and level by embedding post directly in concrete footing.

Temporarily brace fence posts with 2 by 4 wood supports until concrete is set.

C. Do not install bent, bowed, or otherwise damaged panels. Remove damaged components from site and replace.

D. Secure fence panels with standard stainless steel bolts to fence posts after posts have been set in footings.]

E. Gates:

4. Install gates and adjust hardware for smooth operation.

5. Provide concrete center foundation depth and drop rod retainers at center of double swinging gate openings.

F. Touch-up damaged finish with paint supplied by manufacturer and matching original coating.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

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. Framing with dimension lumber – fire retardant treated
2. Wood blocking and nailers – fire retardant treated
3. Building wrap.

B. Related Sections include the following:
1. Division 6 Section "Metal-Plate-Connected Wood Trusses."
2. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment

manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: The Owner will hire an independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Building Wrap:

    a. Celotex Corporation (The); Building Products Division.
    b. DuPont (E. I. du Pont de Nemours and Company).
    c. Parsec, Inc.
    d. Raven Industries, Inc.
    e. Reemay, Inc.
    f. Simplex Products.
    g. Sto-Cote Products, Inc.
    h. Tenneco Building Products.

2.2 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: **AWPA C2 (lumber) and AWPA C9 (plywood)**, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
   a. Ammoniacal, or amine, copper quat (ACQ).

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of **19 percent for lumber and 15 percent for plywood**. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: **Treat items indicated on Drawings, and the following:**

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade and the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Rooftop equipment bases and support curbs.
2. Blocking.
3. Cants.
4. Nailers.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide **Standard, Stud, or No. 3** grade lumber with **19** percent maximum moisture content and the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M**.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1..

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 MISCELLANEOUS MATERIALS

A. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 30 asphalt felt), unperforated.

B. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; and complying with ASTM E 1677, Type I.

1. Thickness: Not less than 3 mils (0.08 mm).
2. Permeance: Not less than 10 perms (575 ng/Pa x s x sq. m).
3. Flame-Spread Index: 25 or less per ASTM E 84.
4. Allowable Exposure Time: Not less than three months.

C. Building Wrap Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.

D. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

E. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. "Fastening Schedule," in the International Building Code.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

3.4 BUILDING PAPER APPLICATION

A. Apply building paper horizontally with 2-inch (50-mm) overlap and 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails. Cover upstanding flashing with 4-inch (102-mm) overlap.

3.5 BUILDING WRAP APPLICATION

A. Cover wall sheathing with building wrap as indicated.

1. Comply with manufacturer's written instructions.
2. Cover upstanding flashing with 4-inch (102-mm) overlap.
3. Seal seams, edges, and penetrations with tape.
4. Extend into jambs of openings and seal corners with tape.

END OF SECTION 06100

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing – Fire retardant treated
2. Roof sheathing – fire retardant treated

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Division 01 Section "Product Requirements."

2.1 PERFORMANCE REQUIREMENTS

Retain "Fire-Test-Response Characteristics" Paragraph below for fire-rated assemblies.

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

Indicate design designations of specific assemblies on Drawings.

1. Fire-Resistance Ratings: Indicated by design designations from [**UL's "Fire Resistance Directory."**

2.2 WOOD PANEL PRODUCTS

A. Plywood: **DOC PS 2**

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category **UC3b**

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: **Treat all plywood unless otherwise indicated**.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: **Treat all plywood unless otherwise indicated.**

2.5 ROOF SHEATHING

If retaining "Plywood Roof Sheathing" Paragraph below, retain one of four options. Structural I provides increased racking resistance. See Evaluations for information about durability classifications of plywood.

A. Plywood Roof Sheathing: **Exterior, Structural I, FRT**

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof[sheathing, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M** or **Type 304 stainless steel**.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with **APA AFG-01** that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

END OF SECTION 06160

SECTION 06176 - METAL-PLATE-CONNECTED WOOD TRUSSES, FIRE RETARTANT TREATED

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 wood roof and truss accessories for the project.

B. Related Sections include the following:

1. Division 6 Section “Rough Carpentry” for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site. All trusses to be frre retardant treated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association
2. SPIB - Southern Pine Inspection Bureau

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on structural drawings.
2. Maximum Deflection Under Design Loads:
   a. Roof Trusses: Vertical deflection of L/480 of span.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners.

B. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer’s written instructions for handling, storing, installing, and finishing treated material.

C. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

D. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

E. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.

F. For installed products indicated to comply with design loads, including structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

H. Qualification Data: For metal-plate manufacturer and installer.

I. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

J. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Metal-plate connectors.
2. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

B. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

C. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

D. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

E. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.

F. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."

2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."

3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

G. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement".

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Metal Connector Plates:
   a. Alpine Engineered Products, Inc.
   b. CompuTrus, Inc.
   c. Eagle Metal Products
   d. Jager Industries, Inc.
   e. Mitek Industries, Inc.
   f. Robbins Engineering, Inc.
   g. TEE-LOK Corporation
   h. Truswall Systems Corporation

2. Metal Framing Anchors:
   a. Alpine Engineered Products, Inc.
   b. Cleveland Steel Specialty Co.
   c. Harlen Metal Products, Inc.
   d. KC Metals Products, Inc.
   e. Silver Metal Products, Inc.
   f. Simpson Strong-Tie Company, Inc.
   g. Southeastern Metals Manufacturing Co., Inc.
   h. United Steel Products Company, Inc.

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive natural or stained finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.

3. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.

4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

C. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded as follows and of the following minimum design values for size of member required according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement":

1. Grading Method: Visual.
2. Design Values: Modulus of elasticity of at least 1,600,000 psi.

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:

B. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, 80Z (24G) coating designation; ASTM A 570/A570M, Structural Steel (SS), Grade 33, and not less than 0.047 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

B. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

C. Nails, Wire, Brads, and Staples: FS FF-N-105.

D. Power-Driven Fasteners: CABO NER-272.

E. Wood Screws: ASME B18.6.1.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times to load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

I. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

J. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.5 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for project.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick.

D. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, face of top plates, and side of stud below.

F. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load bearing-walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

2.6 FIRE-RETARDANT-TREATED WOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
   Exterior type is suitable for both exterior and interior applications. Interior type is only for interior applications.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.8 FABRICATION

A. Cut truss members to accurate lengths, angles and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thickness, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Wood trusses only after supporting construction is in place and is braced and secured.

B. Before installing, splice trusses delivered to Project site in more than one piece.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

I. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

M. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.

C. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END SECTION 06176

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.

B. Related Sections include the following:

   1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Division 9 Section "Painting" for priming and backpriming of finish carpentry.

1.3 DEFINITIONS

A. Inspection agencies, and the abbreviations used to reference them, include the following:

   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NHLA - National Hardwood Lumber Association.
   3. NLGA - National Lumber Grades Authority.
   4. RIS - Redwood Inspection Service.
   5. SCMA - Southern Cypress Manufacturers Association.
   6. SPIB - Southern Pine Inspection Bureau.
   7. WCLIB - West Coast Lumber Inspection Bureau.
   8. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 INTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of **one of** the following species and grades:

1. Grade **1 Common** spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

B. Moldings: Made to patterns included in WMMPA WM 7. Wood moldings made from kiln-dried stock and graded under WMMPA WM 4.

1. Moldings for Transparent Finish (Stain or Clear Finish): N-grade **aspen, basswood, cottonwood, sap gum, white maple, or yellow poplar**.

a. Provide material selected for compatible grain and color.

2. Moldings for Opaque Finish (Painted): P-grade **aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar**.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

B. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

2.3 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
1. Interior standing and running trim, except shoe and crown molds.

C. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours**, unless longer conditioning is recommended by manufacturer**.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 06200

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

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 except where otherwise detailed on drawings:
1. Plastic-laminate cabinets.
2. Plastic-laminate countertops.
3. Cabinet hardware and accessories
4. Quartz surface fabrication countertops
5. Shop finishing interior woodwork.

SPECIAL NOTE: The Owner will provide oak boards, dried and cut to size, and in the quantity necessary for the following wood finished items:

- **2” thick wood stair treads for the open, lobby stair**
- **1 x 6 and 1x4 boards of random lengths for the facing on the Main Reception Desk, Treasurers Office Desk, Commissioner of Revenue Desk, and the Community Services Desk. The boards will be of roughly a 50/50 mixture of red and white oak from local forest**.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For **medium-density fiberboard, high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories, handrail brackets, and finishing materials and processes**.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

3. Show locations and sizes of cutouts and holes for **plumbing fixtures, faucets, soap dispensers, and other items** installed in architectural woodwork.

C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Shop-applied transparent finishes.
2. Shop-applied opaque finishes.
3. Plastic laminates.

D. Samples for Verification: For the following:

1. Lumber with or for transparent finish, **50 sq. in. (300 sq. cm)**, for each species and cut, finished on 1 side and 1 edge.
2. Lumber and panel products with shop-applied opaque finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels, for each finish system and color, with **1/2 of** exposed surface finished.

3. Exposed cabinet hardware and accessories, one unit for each type **and finish**.

E. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production **and installation** of interior architectural.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1. Provide AWI Quality Certification Program **certificate** indicating that woodwork complies with requirements of grades specified.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 8 Section "Door Hardware **(Scheduled by Describing Products)**" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Available Fabricators: Subject to compliance with requirements, fabricators offering interior architectural woodwork that may be incorporated into the Work include, but are not limited to, the following:

1. Any fabricator constructing work in compliance with American Woodwork Institute (AWI) standards, as approved by the Architect and Owner.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade **MD**.
3. Particleboard: ANSI A208.1, Grade **M-2**.
4. Softwood Plywood: DOC PS 1, **Medium Density Overlay**.
5. Hardwood Plywood and Face Veneers: HPVA HP-1.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Laminart.
c. Wilsonart International; Div. of Premark International, Inc.

D. Adhesive for Bonding Plastic Laminate: PVA.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware **(Scheduled by Describing Products)**."

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Butt Hinges: 2-3/4-inch (70-mm), 5-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

D. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, **170** degrees of opening**, self-closing**.

E. Back-Mounted Pulls: BHMA A156.9, B02011.

F. Wire Pulls: Back mounted, **4 inches (100 mm) long, 5/16 inches (8 mm) in diameter**.

G. Adjustable Shelf Standards and Supports: **BHMA A156.9, B04071; with shelf rests, B04081**.

H. Shelf Rests: BHMA A156.9, B04013.

I. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:

1. Box Drawer Slides: **75 lbf (330 N)**.
2. File Drawer Slides: **150 lbf (670 N)**.
3. Keyboard Slide: 75 lbf (330 N).

J. Grommets for Cable Passage through Countertops: **2-inch (51-mm)** OD, color to match countertop, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "**OG** or **SG** series" by Doug Mockett and Co., Inc.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Finish is to be selected.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide **Custom** grade interior woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).

D. Complete fabrication, including assembly, **finishing,** and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 300.

B. Grade: **Custom**.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

E. 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.

F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

H. Wood Species and Cut: **Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated**.

1. Provide split species on trim that face areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.

2.7 QUARTZ SURFACE FABRICATION

Basis of Design - Silestone

1. Thickness: ¾”
2. Physical characteristics:
   a. Static coefficient of friction: 1.41 dry, 0.50 wet, tested to ASTM C1028.
   b. Water absorption: Maximum 0.03 percent, tested to ASTM C97.
   c. Compressive strength: Minimum 29,000 psi, tested to ASTM C170.
   d. Bond strength: Minimum 210 psi, tested to ASTM C482.
   e. Modulus of rupture: Minimum 6300 psi, tested to ASTM C99.
   f. Flexural strength: Minimum 5800 psi, tested to ASTM C880.
   g. Breaking strength: Minimum 480 lbf, tested to ASTM C648.
   h. Stain resistance: Not affected by 10 percent hydrochloric acid or 10 percent KOH, tested to ASTM C650.
   i. Thermal shock resistance: Pass 5 cycles, tested to ASTM C484.
   j. Abrasive index: 65-Ha = 25, tested to ASTM C241.
   k. Thermal expansion: 1.670 x 10^{-5} in/in/deg F, tested to ASTM C531.
   l. Deicing resistance: Rating of 0, tested to ASTM C672/C672M.
   m. Freeze/thaw resistance: 0 tiles at 15 cycles, tested to ASTM C1026.
   n. Flame spread rating: Class 1, tested to ASTM E84.
   o. MOH’s hardness: 7.0

2.3 FABRICATION

A. Cut quartz panels accurately to required shapes and dimensions.
B. Radius exposed edges.
C. Fabricate with hairline joints.
D. Cut holes for [sinks] [faucets] [toilet accessories] [____].

PREPARATIONClean surfaces to receive countertops; remove loose and foreign matter than could interfere with adhesion.

INSTALLATION

Install countertops in accordance with manufacturer’s instructions and approved Shop Drawings.

Adhere countertops to supports with continuous beads of adhesive

Color – Blue Sahara (Silestone color)

2.8 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Grade: **Custom**.

C. AWI Type of Cabinet Construction: **Flush overlay**.

D. Reveal Dimension: **1/2 inch (13 mm**.

E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: **HGS**.
2. Postformed Surfaces: **HGP**.
3. Vertical Surfaces: **HGS**.

4. Edges: **HGS**.

F. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: **High-pressure decorative laminate, Grade VGS**
2. Drawer Sides and Backs: **Solid-hardwood lumber**.
3. Drawer Bottoms: **Hardwood plywood**.

G. 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 Architects selections from laminate manufacturer's full range of colors and finishes in the following categories:

a. Solid colors.
b. Solid colors with core same color as surface.
c. Wood grains.
d. Patterns.

H. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.9 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: **Custom**.

C. High-Pressure Decorative Laminate Grade: **HGS**.

D. 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 Architect's selections from manufacturer's full range of colors and finishes in the following categories:

a. Solid colors.
b. Solid colors with core same color as surface.
c. Wood grains.
d. Patterns.

E. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: **Same as laminate cladding on horizontal surfaces**.

G. Core Material: **Medium-density fiberboard**

H. Core Material at Sinks: **medium-density fiberboard made with exterior glue, or exterior-grade plywood**.

2.10 INTERIOR ORNAMENTAL WORK FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 700.

B. Grade: **Premium**.

C. Wood Species and Cut: **Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated**.

2.11 SHOP FINISHING

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 shop applied or applied after installation. The extent to which the final finish is applied at fabrication shop is Contractor's option, except shop apply at least the prime coat before delivery.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:

1. Grade **Custom**.
2. Staining: **Match approved sample for color**.
3. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.

   a. Apply vinyl wash coat sealer after staining and before filling.

6. Sheen: To be selected.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails **or finishing screws** for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than **36 inches (900 mm)** long, except where shorter single-length pieces are necessary.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with **No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging**.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
3. Secure backsplashes **to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive**.
4. Caulk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

H. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

SECTION 07111 - COMPOSITE SHEET WATERPROOFING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SUMMARY

This section includes the following:

Below-grade wall waterproofing.

PERFORMANCE REQUIREMENTS

General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.

SUBMITTALS

General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

Product Data for each type of waterproofing specified, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.

Shop Drawings showing locations and extent of waterproofing, including details for substrate joins and cracks, sheet flashings, penetrations, tie-ins with adjoining construction, and other termination conditions.

Samples, 3-by-6 inch (75-by-150 mm) minimum size, of each waterproofing material required for Project.

QUALITY ASSURANCE

Installer Qualifications: Engage an Installer who has completed waterproofing similar to that indicated for this Project and who is acceptable to waterproofing manufacturer.

Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

DELIVERY, STORAGE, AND HANDLING

Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

Store materials in their original undamaged packages in a clean, dry, protected locations and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

PROJECT CONDITIONS

Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

Do not apply waterproofing in snow, rain, fog, or mist.

Maintain adequate ventilation during preparation and application of waterproofing materials.

PART 2 - PRODUCTS

MANUFACTURERS

Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

Products: Subject to compliance with requirements, provide one of the following:

Miradri and Miradrain; Mirafi, Inc.
Duramen 700-SM; Pecora Corporation

SELF-ADHERING COMPOSITE SHEET

Rubberized-Asphalt Composite Sheet: 60-mil (1.5-mm-) thick self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick polyethylene film with release liner on adhesive side.

Sheet Type: Manufacturer's standard composite sheet for use when ambient and substrate temperatures exceed 40 deg. F (5 deg C).

Physical Properties: Provide waterproofing complying with the following:

Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.

Ultimate Elongation: 300 percent minimum, ASTM D 412, Die C, modified.

Pliability: No cracks when bent 180 degrees over a 1-inch (25-mm) mandrel at minus 25 deg F (minus 32 deg C); ASTM D 146.

Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3.2-mm) movement; ASTM C 836.

Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.

Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.

Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.

.

MISCELLANEOUS

Provide perforated PVC drain pipe system.

PART 3 - EXECUTION

EXAMINATION

Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.

Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

Notify Architect in writing of anticipated problems using waterproofing over substrate.

SURFACE PREPARATION

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete.

Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.

Install membrane strip centered over vertical inside corners. Install 3/4 inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

At deck-to-wall intersections, extend liquid membrane or sheet membrane flashing onto deck waterproofing and to finished height of sheet flashing.

Outside Corners: Prepare and treat outside corners according to waterproofing manufacturer's written instructions.

Install strip of membrane 12 inches (300 mm) wide, centered over corner.

Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.

At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge and

cover with sheet membrane strips.

SELF-ADHERING COMPOSITE SHEET APPLICATION

Install self-adhering composite sheet according to waterproofing manufacturer's written instructions.

Apply primer to substrate at required rate and allow to dry. Limit priming to areas that will be covered by waterproofing membrane in same day. Reprime areas exposed for more than 24 hours.

Apply and firmly adhere sheet membrane over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2 inch (64-mm) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

When ambient and substrate temperatures exceed 40 deg F (5 deg C), install manufacturer's standard rubberized-asphalt composite sheet.

When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and 5 deg C), install manufacturer's standard, low-temperature, rubberized-asphalt composite sheet.

On substrates to receive hot-mixed asphalt paving, install heavy-duty, rubberized-asphalt composite sheet.

Two-Ply Application: Install sheet membrane with a lap width not less than 50 percent of sheet width to provide a minimum 2 thicknesses of sheet membrane over area to receive waterproofing.

DRAINAGE PANEL INSTALLATION

Place and secure drainage panels according to manufacturer's written instructions. Use adhesives and mechanical fasteners recommended by manufacturer that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed panels during subsequent construction.

FIELD QUALITY CONTROL

Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

PROTECTING AND CLEANING

Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07111

SECTION 07193 VAPOR BARRIERS

PART 1 - GENERAL

1.01 PROVISIONS GOVERNING WORK UNDER THIS SECTION

A. See Division 1.

1.02 DESCRIPTION

A. EXTENT:
1. Interior slabs on grade.
2. Exterior Walls

PART 2 - PRODUCTS

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 Retarder must have all of the following qualities:
1. Permeance of 0.03 Perms [grains/(ft2 *hr * in.Hg)] or less per ASTM F 1249 or ASTM E 96
2. ASTM E 1745 Class A.
3. Minimum of 10 mils thickness.

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.
3. Install continuous over steel studs located on exterior walls (beneath drywall). Carefully repair any penetrations that are necessary in order to maintain integrity of the vapor barrier

END OF SECTION

SECTION 07210 - BUILDING 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 the following:

1. Insulation under slabs-on-grade.
2. Concealed building insulation.

B. Related Sections include the following:
1. Division 3 Section "Cast-in-Place Concrete."
2. Division 4 Section "Unit Masonry Assemblies" for insulation installed in cavity walls and masonry cells.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Glass-Fiber Insulation:

a. CertainTeed Corporation.
b. Johns Manville Corporation.
c. Knauf Fiber Glass.
d. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), unless otherwise indicated.

C. Foil-Faced, Flexible Glass-Fiber Insulation: ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:

1. Nominal density of 1.0 lb/cu. ft. (16 kg/cu. m), thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F (25.7 K x m/W at 24 deg C).

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Protection Board: Premolded, semirigid asphalt/fiber composition board, 1/4 inch (6 mm) thick, formed under heat and pressure, of standard sizes.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless-steel screens (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.

C. Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. For wood-framed construction, install glass or mineral-fiber blankets according to ASTM C 1320 and as follows:

1. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
2. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

E. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.

3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

F. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

END OF SECTION 07210

SECTION 07240

EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. The Exterior Insulation and Finish Coating Systems Application as described and specified herein.
2. Direct Applied Finish Systems

B. Related Documents:
1. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

C. Related Sections:
1. Section 09253 – Gypsum Sheathing
2. Section 07600 – Flashing and Sheet Metal
3. Section 07920 - Sealants

1.2 DEFINITIONS

A. Class PB Exterior Insulation and Finish System (EIFS) is defined by ASTM PS 49 practice for application of Class PB Exterior Insulation and Finish Systems as a "nonload bearing, exterior wall cladding system that consists of an insulation board attached either adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a texture protective finish coat."

1.3 SYSTEM DESCRIPTION

A. Design Requirements
1. Polymer-based protective coating 100% pure acrylic resin based materials. No materials using non-acrylic resins in their formulas will be accepted.
2. Exterior insulation and finish system refers to a non-structural exterior wall assembly composed of the following components:
   a. An approved substrate
   b. Thermal insulation board mechanically or adhesively attached to the substrate per manufacturer’s recommendation
   c. A reinforced base coat applied to the insulation board
   d. A 100% acrylic based textured coating applied over the reinforced base coat.
   e. Approved sealants are required at all dissimilar materials and are specified in Section 07920.
3. Impact Resistance:

a. EIMA 101.86 minimum valves without cracking:
   1) “Standard” System - Adhesive/Base Coat - 50-89 in/lb
   2) Hi-Impact/2 System - Adhesive/Base Coat - 90-150 in/lb

4. From grade to 2nd floor, a minimum 90-150 inch/pounds impact system is required.
5. From 2nd floor up to a minimum 50-89 in/lb impact system is required.
6. High traffic areas: provide 150-175 in/lb impact system.

B. PERFORMANCE REQUIREMENTS

1. General: Provide systems that comply with the following performance requirements:
   a. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
   b. Weather tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind it, including substrates, supporting wall construction, and interior finish.

1.4 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01330.

B. Product Data: Submit technical product data, test reports, installation instructions and recommendations from manufacturer, including data that materials comply with requirements.

C. Submit one 2 ft. x 2 ft. sample of the wall system for each finish, color, and texture selected using same tools and techniques as for the actual project.

D. Shop Drawings: Show fabrication and installation of system including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, termination details, and attachments to construction behind system.

E. Manufacturer’s written certification of installer.

F. Certification that materials meet or exceed requirements.

G. Field-Constructed Mock-Up: Prior to installation of exterior insulation and finish systems, erect mock-ups for each form of wall construction, including typical caulked joints and/or rustication type joints, etc., and finish required to verity selections made under sample submittals. Build

mock-ups to comply with the following requirements, using materials indicated for final work:

1. Locate mock-ups on site in location and of size indicated or, if not indicated, as directed by the Owner's Representative.
2. Obtain the Owner's Representative acceptance of mock-up's visual qualities before start of final work.

H. Affidavits:

1. Where mandated by code, provide affidavits from EIFS and sealant applicators confirming full compliance to all manufacturer's application requirements.

I. As part of Contract close-out, submit with warranty, copies of all "Field Inspection Reports" from EIFS manufacturing representative and a letter from the approved EIFS manufacturer confirming the following:

1. The EIFS as installed has been tested per Code requirements and does not effect the fire rating of the exterior wall assembly.
2. The EIFS application and installation has been inspected by manufacturer's representative and are confirmed to be in full compliance to the manufacturer's minimum application requirements.
3. The specific brand and type of sealants used on this project are compatible with the correctly installed in conjunction with the approved EIFS. Document to also list the approved sealant manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications

1. The Applicator, Fabricator, and Insulation Board Manufacturer shall be approved by the manufacturer in writing on company letterhead. Attach this letter to warranty.
2. The manufacturer shall be a member of the Exterior Insulation Manufacturer's Association - EIMA.
3. The manufacturer shall have manufactured Exterior Insulation and Finish Systems in the United States for at least five years.
4. The installer shall have had a minimum of five years experience installing the specified product on projects similar in scope, and with a record of successful in-service performance.

B. Design and Detailing

1. The Manufacturer's Certified Applicator shall verify that the proposed Substrate is acceptable prior to the application of the System.
2. The System shall be installed in accordance with manufacturer's published details and specific recommendations for this project.

C. Approvals, Listings, and Classifications:

1. Fire-Test-Response Characteristics: Provide system assemblies and components with the following fire-test-response characteristics as determined by testing identical products per test

method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

a. Flame Spread of Insulation Board and Finish Coats: 10 or less when tested individually per ASTM E 84.

b. Smoke Developed of Insulation Board and Finish Coats: 450 or less when tested individually per ASTM E 84.

2. Code Approvals:

a. The EIFS system shall be approved by the applicable building codes and agencies within the jurisdiction of the Project. Code approval must be based on full scale diversified fire testing in its end use configuration by independent agencies whose classifications and requirements have general acceptance as regulator.

D. Pre-installation meeting: The EIFS installer's foreman or superintendent for this project and a representative of the EIFS system manufacturer shall attend the Pre-installation meeting prior to the start of the EIFS application.

E. The performance of the EIFS and recommendation of the proper method of attachment of the system (adhered and/or mechanically fastened) shall be the sole responsibility of the EIFS manufacturer. The EIFS installer shall comply with the manufacturer's recommendations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install system when ambient outdoor air and substrate temperatures are 40 deg F and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 24 hours after installation.

B. Adjacent materials and the wall system shall be protected during installation, while curing and/or unattended, from weather and other damaging conditions.

1.8 COORDINATION

A. The work of this Section shall be coordinated with the work specified in related Sections.

B. Temporary protection shall be provided during the wall system application and prior to the installation of the sealant and flashing systems at all locations that could allow moisture penetration. Do not allow water to penetrate behind EIFS.

C. All joints to be sealed shall be done immediately after completion of field applied wall system.

D. The tops of all walls must immediately be covered with either the final trim or temporary protection to prevent water infiltration behind the system. Coping shall be installed as soon as possible after the installation of the system.

1.9 MAINTENANCE

A. Maintenance Kit:
   1. Supply maintenance kit and store at site where directed by Architect.
      a. Containers of liquids shall be unopened.
   2. Maintenance kit shall contain the following components:
      a. Printed maintenance instructions
      b. One gallon of adhesive
      c. One gallon of finish color coating for each color used
      d. 20 square feet of each type reinforcing fabric
      e. 20 square feet of insulation board

1.10 WARRANTY

A. Manufacturer shall provide a 10-year limited warranty on the labor and materials associated with the EIFS system. This warranty is exclusive of flashings.
   1. This warranty shall be assignable.
   2. This installer shall provide a 2-year warranty for all workmanship related to EIFS application.

B. Work is warranted against:
   1. Material defects, including, but not limited to, peeling, cracking, delamination, flaking, or similar failures.
   2. Seepage and leakage of water or excessive moisture into the building or wall cavities through the system. EIFS to EIFS and EIFS to dissimilar sealer joints.

C. Inspection:
1. The manufacturer shall provide final inspection at the completion of application of the system including all contiguous sealant joints.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. “Sto EIFS, Sto Essence Next”; Sto Finish Systems Div. (888-786-3437)
2. “Senerflex”; Synergy Div., of Degussa Wall System, Inc. (800-221-9255)
3. “Dryvit” Systems, Inc. Outsulation Plus (401) 822-1980 Dick Kroll
4. No substitutions permitted

2.2 GENERAL: All components of the wall system shall be obtained from one manufacturer. No substitutions or addition of other materials will be allowed.

2.3 MATERIALS

A. Compatibility: Provide substrates, adhesive, board insulation, reinforcing meshes, base- and finish-coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.

B. Primer/Adhesive: A factory blended, polymer modified, cement based adhesive/base coat as recommended by the Manufacturer.

C. Insulation Board:
1. Molded-Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by expansion of polystyrene resin beads or granules in a closed mold. Comply with system manufacturer's requirements, ASTM C 578 for Type I, and "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for more stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
a. Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
1) Nominal 1.0 pcf, of the thickness and shape as shown on the Drawings.
2) Flamespread and smoke development shall be less than or equal to 25 and 450 respectively when tested by ASTM E 84.
3) Minimum thickness shall be as shown on Drawings and not less than ¾”.
4) Labeling and quality control shall comply with the building code.

D. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
   1. Standard weight, as recommended by manufacturer and heavy-duty impact resistant in locations as shown on Drawings, and as selected below. See paragraph 3.3 D.

E. Base-Coat Materials: System manufacturer's standard mixture complying with ASTM C 150, Type I, white or natural color, and system manufacturer's standard polymer-based Adhesive/Base Coat.

F. Primer: Sto Primer – 810 or equal.
   1. Color shall be same as finish.

G. Finish Coat: Materials System manufacturer's standard mixture, complying with the following requirements for material composition and method of combining materials:
   1. Factory mixed formulation of 100% pure acrylic polymer emulsion texture finish with color fast mineral pigments forming integral finish color in Natural Swirl texture.
   2. Colors: To be selected from standard colors

H. Acrylic Coating: Acrylic emulsion elastomeric sealer and moisture repellent coating. Color to match exterior finish, applied to top of all walls with less than 6:12 top cap slope. Installed as recommended by the manufacturer.

I. Wall System
   1. Shall have been tested for the environmental tests specified in Paragraph 1.5 and the properties shall meet or exceed the listed values.
   2. Shall have been tested by large scale diversified fire test, Modified ASTM E-108 - Results - The wall system does not contribute to vertical or horizontal flame spread propagation nor produce large quantities of smoke.

J. Cement: Type I Portland Cement, ASTM C-150.

K. Water:
   1. Water shall be clean and potable. Water shall be tested by the installer for excessive levels of iron and all other potentially

damaging substances prior to its incorporation in accordance with the manufacturer's published instructions.

L. Sheathing (Vertical and Horizontal Applications):
1. Type X Glass Mat Water-Resistant Gypsum Sheathing Board, Dens-Glass, by Gold Georgia-Pacific Corp.

M. Air Infiltration Barrier:
1. Material: Refer to Section 07200.
2. Install layer of air infiltration barrier to completely cover all sheathings before installation of EIFS system.
3. Air infiltration barrier not required over concrete masonry units.

N. Vapor Barrier and Tape System.
1. Material: Protecto Flash Building Tape 20, as manufactured by Protecto Wrap Co., 225 S. Delaware, Denver, Co., 8023 (303-777-3001) (800-759-9727).
2. Color: Black.
3. Width: 6" minimum.
4. Locations: Provide and install around all opening in EIFS walls. See drawings for details.
5. Air infiltration barrier not required over concrete masonry units.

O. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with system manufacturer's written requirements, manufactured from vinyl plastic and complying with ASTM C 1063.
1. Casing Bead: Prefabricated one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating.
2. Drip Screed: Prefabricated one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and extended to form a drip.
3. Control Joints: Zinc alloy; size and profile as recommended by EIFS manufacturer.

P. Elastomeric Sealant Products: Provide system manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB" and with requirements in Section 07920 "Sealants" for products.

2.4 MIXING

A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to application of the wall system, the substrate shall be examined by the installer for compliance with the Contract Documents and manufacturer's specifications. The Contractor and Owner's representative shall be advised of all discrepancies. All substrates shall be free of surface and excessive internal moisture. Work shall not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

C. Prepare and clean substrates to comply with system manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.
   1. Apply primer-sealer over substrates where required by system manufacturer for improving adhesion or for protecting substrates from degradation.

3.3 INSTALLATION

A. Comply with ASTM PS 49 and system manufacturer's written instructions for installation of system as applicable to each type of substrate indicated.
   1. Avoid all sources of open flame in immediate are of application.
   2. Under no circumstances shall accelerators, retarders, or other admixtures be used.
   3. Use clean non-metal container, free of all foreign substance, for mixing and preparing material. Do not use container which has been used for or cleaned with a petroleum product.

B. Adhesively and mechanically attach insulation to substrates to comply with ASTM PS 49, system manufacturer's written requirements, and the following:
   1. Apply boards over dry substrates in courses.
   2. Joints:
      a. Stager vertical joints in successive courses to produce running bond pattern.
         1) Offset joints of insulation from joining in sheathing.
      b. EIFS to EIFS joints, vertical or horizontal: Install insulation board with a clear ¾" space prior to backwrap application. The finish joint shall be ½" clear space to receive sealant.

Provide vertical control joints at a maximum 70’-0” within EIFS (keep substrate continuous).

c. EIFS to EIFS joints where building frame has expansion joints or underlying substrate will have localized movement.
   1) Horizontal control joints at floor lines.
   2) Expansion joints within building structural frame: Same basic installation as an EIFS to EIFS joint above. The width of sealant join is a function of pre-determined expansion joint size. The finish joint width should be 4 times the anticipated joint movement.

d. EIFS to Dissimilar materials: (windows, doors, louvers, etc where anticipated movement of sealant joint is static. Installation board shall be installed with a clear 3/4” space prior to the backwrap application. Finish sealant joint width to be minimum 1/2” wide.

e. EIFS to Dissimilar materials (strip windows, or louvers etc. where the anticipated movement of sealant joint is dynamic). Similar condition to EIFS to EIFS where movement is anticipated. The width of sealant joint is a function of overall calculated movement of the step window or louvers. The finish joint width should be 4 times the anticipated joint movement.

3. Interlock ends at internal and external corners.
4. Rasp or sand flush any irregularities projecting more than 1/32" from surface of insulation; do not create depressions deeper than 1/16".
5. Cut insulation to fit openings, corners, and projections and to produce edges and shapes conforming to details indicated.
6. Sealants shall be applied to base coat only. Application to finish coat will not be acceptable.
7. Treat exposed edges of insulation board by encapsulating with base coat, reinforcing fabric, and finish coat.
8. Coordinate flashing installation with installation of insulation.

C. Apply base coat to exposed surfaces of insulation in thickness specified by EIMA and system manufacturer.
   1. Minimum thickness of base coat to be 1/8 inch
   2. Or to application of base coat, remove yellow dust deposits resulting from excessive UV exposure.

D. Fully embed reinforcing fabric of weight indicated below in wet base coat to produce wrinkle free installation:
   1. Fabric Weight: Standard, unless otherwise indicated.
   2. Heavy-Duty Impact Resistant: From ground level to minimum 8'-0" high, at all corners of doors and windows, all column surrounds and in other locations as shown on Drawings.
   3. Mesh to be continuous at corners and overlapped not less than 2-1/2”. Do not lap reinforcing mesh within 8” of corners.

E. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3.4 INSTALLATION OF JOINT SEALANTS

A. Prepare joints for sealants, of type and at locations indicated, to comply with applicable requirements in Section 07920 “Sealants" and in "EIMA Guide for Use of Sealants with Exterior Insulation and Finish Systems, Class PB."
   1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
   2. Joint sealants to be applied after base coat has cured but before applying finish coat.

3.5 CLEANING AND PROTECTING

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 07411 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal Roof Panels.

1.2 REFERENCES

A. ASTM International:

1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
3. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus.
4. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
5. ASTM D523 Standard Test Method for Specular Gloss.
6. ASTM D822 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
7. ASTM D968 Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
8. ASTM D1005 Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.
9. ASTM D1308 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
10. ASTM D2244 Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.
11. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
12. ASTM D4214 Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
13. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
14. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
15. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
16. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
17. ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
18. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Systems by Uniform Static Air Pressure Difference.
19. ASTM E1680 Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
20. ASTM G23 Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials.

B. Underwriters Laboratories, Inc. (UL):

1. UL 580 Tests for Uplift Resistance of Roof Assemblies.

C. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA):

1. Architectural Sheet Metal Manual.

D. The National Roofing Contractors Association (NRCA):

1. Roofing and Waterproofing Manual (including Construction Details), and Handbook of Accepted Roofing Knowledge.

E. Englert Inc.:

1. Manufacturer's Construction Details Handbook.

F. American Institute of Steel Construction (AISC):

1. Steel Construction Manual.

G. American Iron and Steel Institute (AISI):

1. Cold Formed Steel Design Manual.

1.3 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 01 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data and installation instructions.

C. Shop Drawings: Provide drawings as follows:

1. Shop drawings are to be small-scale roof plans and elevations, indicating extent of work to be performed.
2. Include sections of roof, fascia, walls, siding and soffits, for each condition, detailing flashing and trim for different conditions, such as eaves, outside and inside corners, ridges, valleys, gutters, end wall terminations, closures and similar conditions, showing a full and complete installation.
3. Show securement of panels and clips, spacing, type and number of fasteners, as recommended by manufacturer.

D. Samples: Submit selection samples as follows:

1. 2 foot (610 mm) long sample panel indicating metal, gauge, color, texture and finish.

E. Quality Assurance/Control Submittals: Submit the following:

1. Test Reports: Submit test reports demonstrating compliance with finish requirements.
2. Certificates: Submit manufacturer's certificate that products meet or exceed all specified requirements.

F. Closeout Submittals: Submit the following:

1. Warranty documents specified herein.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

B. Mock-Ups: Install approximately 500 ft^2 (47 m^2) of product in place for Architect's approval, before proceeding with substantial work.

1. Subject to acceptance by owner, mock-up may be retained as part of finish work.
2. If mock-up is not retained, remove and properly dispose of mock-up.

1.5 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 01 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1. Store materials above ground, on skids.
2. Protect material with waterproof covering and allow sufficient ventilation to prevent condensation buildup or moisture entrapment on the materials.

1.6 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents. Provide warranties as follows:

1. Warranty covering the metal substrate against rupture, perforation and structural failure due to normal atmospheric corrosion.
2. Warranty on paint finish against cracking, peeling, blistering, chalk and color change.
3. Substrate Warranty Period: **25** years beginning with date of substantial completion.
4. Finish Warranty Period: **35 years for Standard Colors**.

PART 2 - PRODUCTS

2.1 METAL ROOF PANEL SYSTEMS

A. **Basis of design is the following: Manufacturer - Englert Inc**.

a. **S2400 Mechanically Seamed Roof System**, 24 inch panel width with 2 inch mechanically seamed ribs, 180degree seam.
b. Wind Uplift Resistance (UL 580): Class 90.
c. Air Infiltration (ASTM E1680, ASTM E283):
d. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).

e. Installation Method: Solid deck

2.2 PRODUCT SUBSTITUTIONS

A. Substitutions: Other equal products will be considered. If the Contractor wants another product to be considered, then a detailed, side by side comparison of that product with the one specified, shall be provided. All material, features, finishes, warranties, etc, shall be clearly listed, showing what is specified and what is being proposed. The proposed product must meet or exceed the specified product on all comparison points.

2.3 MATERIALS

A. Provide substrate materials as indicated below:

1. **Steel, with baked-on finish. Kynar 500**
   a. **22 gauge G90 Galvanized (ASTM A653), 50 ksi yield, 52 ksi tensile**

2.4 ACCESSORIES

A. Provide the following accessory products and materials:

1. Roofing Felt:

   a. Type: 30 lb.
   b. Manufacturer: Acceptable to metal panel manufacturer.

2. Clips, Closures, Fasteners:

   a. Type: Acceptable to metal panel manufacturer.
   b. Manufacturer: Acceptable to metal panel manufacturer.

3. Solder:

   a. Type: Acceptable to metal panel manufacturer.
   b. Manufacturer: Acceptable to metal panel manufacturer.

4. Ice and Water Shield:

   a. Type: Acceptable to metal panel manufacturer.
   b. Manufacturer: Acceptable to metal panel manufacturer.

5. Flashing and Trim:

   a. Type: Acceptable to metal panel manufacturer.
   b. Manufacturer: Acceptable to metal panel manufacturer.

6. Roof Curbs:

   a. Type: Acceptable to metal panel manufacturer.
   b. Manufacturer: Acceptable to metal panel manufacturer.

2.5 FABRICATION

A. Panel Construction:

1. Panels shall be uniformly dimensioned, roll formed to exact lengths to avoid trimming.
2. Panels shall be continuous from ridge to eaves with no end laps with no face penetration of panels, except as indicated and for securing panels to facilitate directional expansion/contraction.

B. Flashing and Trim:

1. Furnish all exposed standard or special flashing/trim and such other material break formed in the same gauge, color and finish to match roofing panels.
2. Furnished materials with protective strippable film to be removed upon installation.
3. Furnish accessories such as clips, closures, fasteners, etc., shall be as recommended by manufacturer.

2.6 FINISHES

A. Factory Priming and Finishing:

1. Standard color coating comprised of a 0.8 - 0.9 mil full strength, 70% Kynar 500/Hylar 5000 fluorocarbon (Polyvinylidene Fluoride PVF2) coating over urethane primer of 0.2 - 0.3 mil on finish side, **On steel, primer and wash coat on reverse**. Face film thickness: 1.0 mil + 0.2 mil.

   a. Film Thickness Topside Finish (ASTM D1005): Primer 0.2 - 0.3 mil Kynar 500, top coat 0.8 - 0.9 mil. Reverse side finish 0.2 - 0.3 mil primer with a wash coat. Total dry film thickness for the coating system 1.0 mil nominal.
   b. Specular Gloss (ASTM D523): 5 - 10% reflectance specular at a glossmeter angle of 60 degrees.
   c. Humidity Resistance (ASTM D2247): No blistering, cracking, peeling, loss of gloss or softening of finish after [**3000 hours aluminum**] [**1000 hours coated steel**] of exposure at 100% humidity at 95 degrees F (35 degrees C).
   d. Salt Spray Resistance (ASTM B117): Samples diagonally scored and subjected to 5% - at 95 degrees F (35 degrees C), neutral salt spray, then taped with Scotch #610 cellophane tape: [**3000 hours aluminum**] [**1000 hours coated steel**] no blistering and no loss of adhesion greater than 1/8 from score line.
   e. Chemical Resistance (ASTM D1308): No effect after 24 hour exposure of a 10% solution of hydrochloric acid and 18 hour exposure to 20% sulfuric acid including exposure to 10% muriatic acid and nitric acid fumes.
   f. Chalking Resistance (ASTM D659): No chalking greater than #8 rating test procedure after a 3000 hour weatherometer test.
   g. Color Change (ASTM D822, ASTM G23, ASTM D2244 South Florida 10 years): Finish coat color change shall not exceed 5 NBS units after 3000 hour weatherometer test.
   h. Abrasion Resistance (ASTM D968): Shall pass 60 liters/mil, minimum of falling sand, Method A.

2. Galvalume Plus:

   a. High performance clear organic coating applied over Galvalume.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the metal roof and wall panel manufacturer.

3.2 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of the metal roof and wall panel system.

   a. Verify substrate is uniform, even and symmetrical by running a string test.
   b. Inspect to ensure that all purlins or other substructure and framing members are flat and insulation is embedded symmetrically so when the metal panels are applied, they will not appear wavy or distorted.

2. Do not proceed with installation of the metal roof and wall panel system until unacceptable conditions are corrected.

3.3 INSTALLATION

A. General: Comply with the following:

1. SMACNA Architectural Sheet Metal Manual.
2. NRCA Roofing and Waterproofing Manual and Handbook of Accepted Roofing Knowledge.
3. Manufacturer's Construction Details Handbook.
4. AISC Steel Construction Manual.
5. AISI Cold Formed Steel Design Manual.

B. Install metal panel system plumb, level and straight [**over a layer of 30 lb felt, (dry)**] with a minimum 6 inches (152 mm) horizontal lap and 12 inches (305 mm) end lap.

C. Install panel system in accordance with approved shop drawings.

D. Make no face penetrations or perforations in metal panels by fasteners except as indicated or with specific approval by Architect.

E. Install all panels continuous from ridge to eaves with no horizontal end laps.

F. End lap all flashing and trim at least 3 inches (76 mm).

G. Miter and solder all gutters and seal with a lining of ice and water shield membrane applied at the laps to provide watertight condition.

1. Apply sealant at all butt joints.
2. Counter-flash or paint to match all soldered areas.

H. Treat all valleys with a layer of ice and water shield spread out at least 24 inches (610 mm) each side from the center of the valley, on both sides, before applying valley flashing.

I. End lap at least 6 inches (152 mm) at joints.

J. Exercise care during installation to avoid damage or scratching of the panels.

1. Avoid walking on metal roof panels after installation is completed.

3.4 CLEANING

A. Peel off any strippable film on flashing components as they are installed.

B. Touch up all minor scratches and spots.

C. Remove and legally dispose of all debris resulting from work under this Section.

3.5 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 07462 Fiber Cement Soffit Panels

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiber cement soffit panels

1.2 REFERENCES

A. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.

B. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

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: Provide detailed drawings of a typical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 5 years experience with installation of similar products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 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.

1.7 WARRANTY

A. Product Warranty: Limited, non-pro-rated product warranty.
   1. Soffit panels - 30 years.

B. Finish Warranty: Limited product warranty against manufacturing finish defects.
   1. When used for its intended purpose, properly installed and maintained according to published installation instructions, warranty period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: James Hardie Building Products, Inc

B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

C. Soffit Panels: HardieSoffit HZ10 soffit panel, factory sealed on 5 sides as manufactured by James Hardie Building Products, Inc.. Thickness is ¼".
   1. Type: Smooth vented, provides 5 square inches of net free ventilation per linear foot, 24 inches by 8 feet.

2.2 FASTENERS

Provide corrosion resistant screws or nails, as recommended by the soffit panel manufacturer.

2.3 FINISHES

A. Factory Finish:
   1. Product: ColorPlus Technology by James Hardie.
   2. Definition: Factory applied finish; defined as a finish applied in the same facility and company that manufactures the siding substrate.
   3. Process:
      a. Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing process.
      b. Each finish color must have documented color match to delta E of 0.5 or better between product lines, manufacturing lots or production runs as measured by photospectrometer and verified by third party.
   4. Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
   5. Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement manufacturer. Provide quantities as recommended by manufacturer.

B. Factory Finish Color Soffit :
   Choice of Alpine Frost JH50-10 or Arctic White JH10-20.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If framing preparation is the responsibility of another installer, notify Architect of

unsatisfactory preparation before proceeding.

C. Clean surfaces thoroughly prior to installation.

D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07531 - EPDM MEMBRANE ROOFING

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. Adhered membrane roofing system.

B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking**.**.
2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 7 Section "Joint Sealants."
4. Division 7 Section “Building Insulation”

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

1. Fire/Windstorm Classification: Class 1A-**90**.

2. Hail Resistance: **SH**.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.

C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

E. Qualification Data: For Installer and manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

G. Research/Evaluation Reports: For components of membrane roofing system.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Warranties: Special warranties specified in this Section.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has **UL listing** for membrane roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain components for membrane roofing system **from same manufacturer as roofing membrane, or approved by roofing membrane manufacturer**.

E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method

below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class **A**; ASTM E 108, for application and roof slopes indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, **roofing accessories, roof insulation,** and other components of membrane roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: **Two** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type **I, nonreinforced** uniform, flexible sheet made from EPDM, and as follows:

1. Manufacturers:

   a. Carlisle SynTec Incorporated.
   b. Celotex Corporation.
   c. ERSystems.
   d. Firestone Building Products Company.
   e. GenFlex Roofing Systems.

2. Thickness: **60 mils**, nominal.
3. Exposed Face Color: Black.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Cold Fluid-Applied Membrane Adhesive: Manufacturer's standard cold fluid-applied bonding adhesive formulated to adhere fleece-backed roofing membrane to substrate.

E. Seaming Material: **Manufacturer's standard synthetic-rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film**.

F. Lap Sealant: Manufacturer's standard single-component sealant**, color to match roofing membrane**.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

I. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.

J. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 VAPOR RETARDER

A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.

1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
2. Adhesive: Manufacturer's standard lap adhesive, FMG approved for vapor-retarder application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 VAPOR-RETARDER INSTALLATION

A. Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

1. Seal side and end laps with **tape**.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.4 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

   1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

H. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

I. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

J. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

K. Install roofing membrane and auxiliary materials to tie in to existing roofing.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07531

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and the general provisions of the Contract, including the General and Supplementary Conditions apply to the work specified in this section.

1.2 SUMMARY

A. Section Includes:

1. Gutters and Downspouts
2. Sheet metal flashing and trim.
3. Through-wall flashing
4. Rubber vent flashing

1.3 SUBMITTALS

A. Product Data.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gutters – 7” x 7”, .032 aluminum, Ogee style, with Kynar 500 finish. Provide heavy duty hidden hangers at 24” oc., max. Color: To be “white”, as selected by architect from manufacturer's standard colors.

B. Downspouts – 3” x 4”, .027 aluminum, Plain square style with Kynar “white” finish, as selected from manufacturer’s standard colors

C. Sheet metal flashing and trim - Prefinished Galvanized Steel Sheet: Coil coated, commercial quality steel sheet, ASTM A 526 or ASTM A 527, G90 hot-dip galvanized.
Minimum thickness: 22 gage (0.0299 inch) , unless indicated otherwise.
Finish: 70 percent "Kynar 500" or "Hylar 5000" resin finish over epoxy primer; minimum system thickness 1.0 mil. Provide manufacturer's standard prime coat on underside.
Color: Selected by architect, after contract award, from manufacturer's standard color selection.

D. Through-wall flashing - Laminated Sheet Flashing: Laminate one layer of asphaltic kraft paper or asphalt-impregnated fabric to each face of a 5 ounce copper sheet.
Foam Backing For Flexible Flashings: Closed-cell foam rubber; polyethylene, neoprene, or similar soft, compatible material.

E. Rubber Vent Flashing: Dektite E.P.D.M. Pipe Flashing System.

2.2 ACCESSORY MATERIALS

A. Fasteners: Corrosion-resistant metal of same material as the material being fastened, or other material recommended by sheet metal manufacturer. Match finish and color of exposed fastener heads to finish and color of sheet material being fastened.

B. Joint Adhesive: Two-component noncorrosive epoxy adhesive, recommended by metal manufacturer for sealing of nonmoving joints.
Bituminous Coating: Heavy bodied, sulfur-free, asphalt-based paint; FPS TT-C-494.

2.3 FABRICATION - GENERAL

A. Form sheet metal to match profiles indicated, substantially free from oil-canning, fish-mouths, and other defects.

B. Comply with SMACNA "Architectural Sheet Metal Manual" for applications indicated. Provide for thermal expansion of exposed sheet metal work exceeding 15 feet running length.
Flashing and trim: Provide movement joints at maximum spacing of 10 feet; no joints allowed within 2 feet of corner or intersection.

C. Conceal fasteners and expansion provisions wherever possible.

D. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
Gage: As recommended by SMACNA or metal manufacturer for application, but in no case less than gage of metal being secured.

E. Built-in flashings and receivers shall have ends folded up to form a pan and seal joints.

2.4 SHEET METAL FABRICATIONS

A. General: As a minimum, fabricate flashings using materials in the thickness listed for each flashing application. All flashing in contact with standing seam metal roofing shall be approved for use by roofing manufacturer.

B. Concealed Wall Flashings: Through-wall flashing: Laminated copper/kraft paper. Flashings around window or door openings: Laminated copper/kraft paper.

PART 3 - EXECUTION

3.1 PREPARATION

A. Deliver the following items to entities performing work, for incorporation into their work: Gypsum sheathing and EIFS: Division 6.

B. Isolate dissimilar metals by means of a heavy bituminous coating, approved paint coating, adhered polyethylene sheet, or other means approved by the architect.

3.2 INSTALLATION

A. General: Except as indicated otherwise, comply with sheet metal manufacturer's installation instructions and recommendations in the SMACNA "Architectural Sheet Metal Manual."

B. Counterflashings: Coordinate installation of counterflashings with installation of

assemblies to be protected by counterflashing. Install counterflashings in reglet or receiver of other sheet metal fabrication. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant. Turn up ends of all built-in flashings to form pan and seal.

C. Flexible Flashing Installation: Take care during and after installation to avoid puncture or rupture of flexible flashing.

3.3 CLEANING AND PROTECTION

A. Repair or replace work, which is damaged or defaced, as directed by the architect.

B. Remove from sheet metal surfaces any debris or substances, which will inhibit uniform weathering.

C. Protect sheet metal work as recommended by installer so that completed work will be clean, secured, and without damage at substantial completion.

END SECTION 07600

SECTION 07725 - SNOW GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rail-type, seam-mounted snow guards.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

   1. Include details of rail-type snow guards.
   2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

C. Samples: [**Full-size unit**] [**Base, bracket, and 12-inch- (300-mm-) long rail**].

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of snow guard, for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

   1. Temperature Change: [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**] .

B. Structural Performance:

1. Snow Loads: 40 psf

C. Seam-Mounted, Rail-Type Snow Guards:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sno-Gem, Inc.; Sno-Barricade Clamp-on Series or comparable product by one of the following:

a. Snow Management Systems; a division of Contek, Inc.
b. TRA-MAGE, Inc.

2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with **one rail**, **Powder coated or Kynar coated to match roof color** .
3. Material: Aluminum
4. Provide one single row of the snow guard system, as shown on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

B. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.
2. Seam-Mounted, Rail-Type Snow Guards: **Zinc Zamak #3 Alloy ad Aluminum clamps attached to vertical ribs of standing-seam metal roof panels.**

City Hall

END OF SECTION 07725

SECTION 07920 - JOINT SEALANTS

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 sealants for the following applications, including those specified by reference to this Section:

B. This Section includes sealants for the following applications:

1. Exterior of building:
   a. Perimeter joints between building materials and frames of doors and windows.
   b. Other joints as indicated.

2. Interior of building:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
   d. Other joints as indicated.

C. Related Sections include the following:

1. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 8 Section "Glazing" for glazing sealants.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.2 ELASTOMERIC JOINT SEALANTS

A. Exterior caulking – Use Dynatrol 9, as manufactured by Pecora Corp., polyurethane sealant.

B. Interior caulking – Use AC-20 as manufactured by Pecora Corporation, silicone, acrylic latex sealant.

2.3 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 07920

SECTION 08110 - HOLLOW METAL FRAMES AND DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and the general provisions of the Contract, including General and Supplementary Conditions apply to the work specified in this section.

1.2 SCOPE

A. Work required under this section consists of, but is not limited to, hollow metal frames, transoms, mullions, louvers, and related items necessary to complete work indicated on drawings and described in these specifications.

1.3 QUALIFICATIONS

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.4 SUBMITTALS

A. Submit complete manufacturer's specifications and shop drawings in accordance with Section 01300, of all items specified to the architect for approval. Submit all details within 15 days after award of contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors and frames that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Doors and Frames:
    a. American Steel Products Corp.
    b. Amweld Building Products, Inc.
    c. Ceco Door Products.
    d. Curries Company.
    e. Steelcraft Mfg.

2.2 HOLLOW METAL FRAMES

A. Hollow metal frames shall be of design shown. Exterior frames shall be galvanized with unitized weatherstripping and of 16 gauge steel, with welded, mitered corners, in accordance with manufacturer's specifications. Frames shall be finished with protective shop coat of standard metal primer. Frames shall be reinforced where hardware or other fastenings are to be secured. Reinforcement shall be of sufficient size and at least 1/8"

thick. Provide 3 anchors per jamb minimum, for each door jamb. Frames shall be anchored to floor construction of 14 gauge steel angle clips welded to back of jamb and bolted to floor with 1/4 x 1 1/2" expansion bolts (2 each clip). Each frame shall be prepared to receive 3 rubber mutes in jambs and 2 mutes in head. Mutes to be sent to job in separate package. Furnish frames with UL Label as required by door schedule. Interior frames, other than special and labeled units, shall be welded drywall profile, 16 gauge Type DW-16 components.

2.3 HOLLOW METAL DOORS

A. Where scheduled on plans, furnish and install hollow metal doors with honeycomb core, constructed with 18 ga. sheets and with stiffeners; provisions for hardware as scheduled in accordance with manufacturer's standard specifications. Door shall be manufactured as described for frames, or approved equal. Exterior doors shall be constructed with tops finished flush and doors shall be galvanized with insulated core. Provide vision panels where shown on drawings. Furnish rated doors of classification scheduled where called for.

PART 3 - EXECUTION

3.1 ERECTION

A. Hollow metal doors and frames shall be erected by skilled workers. Frames shall be carefully plumbed and aligned. Trim and glazing stops shall be coped or mitered with tight hairline fit. Brace frames until permanent anchors are set. Anchor bottoms of frames to floor with expansion bolts or with power fasteners. In the application of glazing beads or other trim parts, care shall be taken not to distort metal. Minor damage to metal incurred during erection may be repaired by filling with lead or lead alloy ground smooth and flush, if strength and appearance of finish work are not impaired by doing so, and if architect approves. Otherwise, new materials shall be furnished.

3.2 PROTECTION AND CLEANING

A. Protect frames from damage during the transportation and at job site. Store at site under cover on wood blocking, or on suitable floors. After installation, protect doors and frames from damage during subsequent construction activities. Damaged work will be rejected and shall be replaced with new work. Upon completion, metal surfaces of doors and frames shall be thoroughly cleaned.

END SECTION 08110

SECTION 08211 - WOOD DOORS

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. Flush wood doors with wood-veneer faces.
2. Shop priming wood doors.

B. Related Sections include the following:

1. Division 8 Section "Hollow Metal Frames" for metal door frames.
2. Divison 8 Section “Glazing”

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.

1. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the following standard:

1. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty 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.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not comply with tolerances in referenced quality standard.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time after the date of Substantial Completion:
   a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer, or approved equivalent:

1. Wood Doors:
   a. Algoma Hardwoods Inc., Commercial wood door**. 1 ¾" thick**

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish:

1. Grade: **Premium, with Grade A faces**.
2. Cut: Rotary cut or Plain sliced-
3. Species - Red Oak, White Oak, or Yellow Birch (Natural) All wood doors in the building to be same species and cut

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking at particleboard-core doors as follows:

a. 5-inch top-rail blocking, at doors indicated to have closers.
b. 5-inch bottom-rail blocking, at exterior doors and doors indicated to have kick, mop, or armor plates.
c. 5-inch midrail blocking, at doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
4. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

2.4 FABRICATION

A. Fabricate flush wood doors in sizes indicated for Project site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard's requirements for factory finishing.
B. Prime wood doors at factory.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine 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 plumb jambs and level heads.
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. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

3.3 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08211

SECTION 08333 SECURITY GRILLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Upcoiling Security Grilles, power operated.

1.2 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. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

H. NEMA MG 1 - Motors and Generators.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

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: Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

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. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 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: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.5 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.

1.6 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corporation

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 UPCOILING SECURITY GRILLES

A. Overhead Coiling Aluminum Grilles: Overhead Door Corporation 670 Series.
   1. Curtain: Horizontal 5/16 inch (7.8 mm) diameter rods with network of vertically interlocking links to form a pattern. Bottom bar extruded aluminum tubular shape.
      a. Material: Aluminum.
      b. Vertical Rod Spacing:
         1) 2 inches (51 mm) on center.
      c. Pattern:
         1) Straight lattice; horizontal spacing 6 inches (152 mm) on center.
   2. Finish:
      a. Aluminum clear anodized.
   3. Guides:
      a. Extruded aluminum shapes with retainer grooves and continuous silicone treated wool-pile strips or PVC inserts to reduce noise and assist operation.
      b. Guides face mounted on adjacent construction.
   4. Brackets: Minimum 3/16 inch (4.8 mm) steel to support barrel, counterbalance and hood as applicable.
   5. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with maximum deflection of 0.03 inches per foot of span. Counterbalance adjustable by means of an adjusting tension wheel.

6. Hood:
   a. Primed steel, 24 gauge (6 mm) .
   b. Aluminum with intermediate supports as required.
7. 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:
      1) Pneumatic sensing edge , or
      2) Electric sensing edge.
   b. Operator Controls: Control stations with open, close, and stop functions.
      1) Push-button or switch operation.

      2) Surface mounting.
      3) Flush mounting.
      4) For interior location.
   c. Emergency Egress: Provide code compliant emergency egress operator system with self-locking mechanism that automatically unlocks, automatically releases, and opens grille fully to permit passage if power is not available.
   d. Special Operation:
      1) 670 series UL listed egress electric operator.
8. Locking:
   a. Cylinder lock for electric operation with interlock switch.
   b. Thumb turns.
   c. 670 series egress grille self locking mechanism to prevent forced opening of a closed grille that does not interfere with normal electric operation but fail safe for emergency operation.

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.

3.4 ADJUSTING

A. Test security grilles 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 08410 - ALUMINUM ENTRANCES

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. Exterior and/or interior aluminum entrance storefront systems.

B. Related sections include the following:

1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.

2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:

B. Air infiltration and water penetration exceeding specified limits.

C. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

D. Glazing: Physically and thermally isolate glazing from framing members.

E. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

F. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch , whichever is smaller, unless otherwise indicated..

G. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

H. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

C. For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

B. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

E. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

A. General Warranty: The special warranty 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.

B. Water leakage through fixed glazing and frame areas.

C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product:

1. Kawneer Company, Inc. – "Trifab" 451-T System – Center-Glazed.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

B. Sheet and Plate: ASTM B 209.

C. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 .

D. Extruded Structural Pipe and Tubes: ASTM B 429.

E. Bars, Rods, and Wire: ASTM B 211.

F. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

G. Glazing as specified in Division 8 Section "Glazing."

H. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

I. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

J. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS

A. **Doors: "Kawneer – 350 Heavy Wall Entrance"**

B. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazingstops and preformed gaskets. Provide square and beveled crossrails as indicated on drawings.

C. Extruded Sill Flashing: Provide manufacturer's standard extruded sill flashing at ALL aluminum storefront window and storefront systems.

D. Design: Vertical stile: 3 1/2" nominal width; 3 1/2" Top & 6 1/2" Bottom rails.

E. Standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories.

F. Reinforce members as required to retain fastener threads.

G. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

H. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

I. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

2.4 HARDWARE

A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

B. Ball-Bearing Butts: ANSI/BHMA A156.1, Grade 1, 5-knuckle, 4-1/2-by-4-inch ball-bearing butts. Provide nonremovable pins at hinges exposed to door outside and provide nonferrous hinges for applications exposed to weather. Provide 3 hinges at each leaf for doors up to 36 inches wide and 80 inches tall; provide 4 hinges at each leaf for taller doors.

C. Closers, General: Comply with manufacturer's recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.

D. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.

E. Opening Force: Comply with the following maximum opening-force requirements for locations indicated:

1. Exterior Doors: 15 lbf .

2. Interior Doors: 5 lbf .

F. Surface-Mounted Overhead Closers: ANSI/BHMA A156.4, Grade 1. Provide cover and the following:

1. Mounting: Hinge side.

2. Hold Open: Automatic, at angle selected by Architect from manufacturer's standard options.

3. Back Check: Adjustable.

G. Door Stops: ANSI/BHMA A156.16, Grade 1, floor- or wall-mounted door stop, as appropriate for door location indicated, with integral rubber bumper.

H. Cylinders: As specified in Division 8 Section "Door Hardware."

I. Cylinder Guard: Manufacturer's standard hardened-steel security ring with retainer plate for inside stile wall that protects lock cylinder from removal by wrenches, prying, or sawing.

J. Deadlock: Manufacturer's standard mortise deadlock with minimum 1-inch- long throw bolt and complying with ANSI/BHMA A156.5, Grade 1 requirements.

K. Deadlatch Locks: Manufacturer's standard mortise deadlatch with minimum 1/2-inch-long latch bolt and auxiliary bolt located below latch bolt and complying with ANSI/BHMA A156.5, Grade 1 requirements.

L. Lever Handles: Manufacturer's standard cast-aluminum-alloy, inside-lever, deadlatch operating unit.

M. Latch Paddle Devices: Manufacturer's standard extruded-aluminum deadlatch operating paddle.

N. Provide units for push and pull applications at interior entrances.

O. Hook-Bolt Locks: Manufacturer's standard mortise hook bolt with 5-ply laminated steel, hook-shaped throw bolt, and complying with ANSI/BHMA A156.5, Grade 1 requirements.

P. Lockset Faceplates: Manufacturer's standard extruded-aluminum faceplate for lock type indicated that lays flush with door stile.

Q. Provide radiused faceplate with weather sweep extending full length of lock at meeting stiles of pairs of doors.

R. Strikes: Provide Manufacturer’s standard electric strikes for exterior aluminum storefront doors. Coordinate with security equipment supplier.

S. Vertical-Rod Exit Devices: Concealed, vertical-rod exit device complying with UL 305 requirements, with 2-point top and bottom latching that is released by a full-width crash bar or when locked down (dogged) by lock cylinder or retracting screws beneath housing.

T. Pull Handles: As selected by Architect from manufacturer's full range of pull handles and plates.

U. Push Bars: As selected by Architect from manufacturer's full range of full-door-width, single-bar push bars.

V. Thresholds: At exterior doors, see drawings for standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 1/2-inch- high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:

1. Material: Aluminum.

X. Weather Sweeps: Manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

C. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

D. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.

E. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. **Color: Clear anodized**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against

galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.3 FIELD QUALITY CONTROL

A. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.

B. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 08423 - REVOLVING DOOR ENTRANCES

PART I – GENERAL

1.01 SUMMARY

A. WORK INCLUDED: Furnish complete manual aluminum door system, as specified, that has been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

B. RELATED WORK:

1. Concrete: Division 03, applicable sections.
2. Masonry: Division 04, applicable sections.
3. Thermal and Moisture Protection: Division 07, applicable sections.
5. Openings: Division 08, applicable sections.
6. Electrical: , applicable sections.

1.02 REFERENCES

A. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA) 101: Appendix Dissimilar Materials.

B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

1. ANSI 156.27: Power and Manual Operated Revolving Pedestrian Doors
2. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Methods of Test.

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B221: Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes.

D. THE ALUMINUM ASSOCIATION (AA): Aluminum Finishes Manual

1.03 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer's complete product and installation data.

B. SHOP DRAWINGS: Submit drawings showing layout, profiles, product components including anchorage, accessories, finish and glazing details (where required).

C. QUALITY ASSURANCE AND CLOSEOUT SUBMITTALS: Submit the following:

1. Manufacturer's Operation and Maintenance Data.
2. Warranty document as specified herein.

1.04 QUALITY ASSURANCE

A. INSTALLERS QUALIFICATIONS: Installer shall be factory trained and experienced to perform work of this section.

B. MANUFACTURER’S QUALIFICATIONS: Manufacturer to have minimum (5) five years successful experience in the fabrication of manual doors of the type required for this project. Manufacturer capable of providing field service representation during installation, approving acceptable installer and approving application method.

1.05 WARRANTIES

A. MANUFACTURER'S WARRANTY: Units to be warranted against defect in material and workmanship for a period of one year from the Date of Substantial Completion. Electronic speed control shall be warranted for a period of three years from the Date of Substantial Completion. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.

B. DISTRIBUTOR'S WARRANTY: One year warranty: Labor & transportation charges for defective parts replacement. Three year Distributor's Warranty for electronic speed control.

1.06 PROJECT CONDITIONS

FIELD MEASUREMENTS: Verify actual dimensions/openings by field measurements before fabrication and record on shop drawings. Coordinate with fabrication and construction schedule to avoid construction delays.

1.07 DELIVERY, STORAGE AND HANDLING

A. ORDERING AND DELIVERY: Comply with factory's ordering instructions and lead time requirements. Delivery shall be in factory's original, unopened, undamaged containers with identification labels intact.

B. STORAGE AND PROTECTION: Provide protection from exposure to harmful weather conditions and vandalism.

PART II – PRODUCTS

2.01 MANUFACTURER

HORTON AUTOMATICS, a division of Overhead Door Corporation, , or an approved equivalent that meets or exceeds these specifications, shall manufacture manual revolving door of type and size specified on plans and door schedule.

2.02 EQUIPMENT

A. MANUFACTURED DOOR UNITS: Shall be EasyFlow® Series 9500 Manual Revolving Door, or an approved equivalent, in three or four wing configuration.

B. SPEED CONTROL: Precision machined steel casting overhead speed control with precision machined 100:1 ratio gear train, steel case, adjustable and replaceable brake blocks. The overhead speed control device is limited up to 12 RPM (refer to ANSI standard 156.27) and provides a smooth and effective braking action with brake shoes operating in an oil bath.

1. Option: Electronic speed control: Solid state overhead control shall provide friction-free rotation up to 2 RPM lower than governed speed (12 RPM max). An optical sensing circuit shall monitor door speed and apply resistance to door rotation in 3 levels according to door speed. Centrifugal mechanical systems shall not be considered equal. Speed adjustment shall be by simple potentiometer adjustment not requiring removal or resealing of speed control mechanism.

C. COLLAPSING MECHANISM: Door design shall be equipped with mechanical breakaway and completely bookfold in case of emergency as required by Codes. Wings can be broken away with 80-130 lbs (355-578 N) of force (adjustable).

D. ENCLOSURE: Shall be extruded aluminum and glass/glazing material and shall be constructed maintaining proper clearances and weather seal.

2. Round Design: Shall be 1 3/4" (44 mm) deep with standard glazing prep for 7/16" (6 mm) curved glass/glazing material and offset to interior.

3. Canopy: Standard canopy shall match contour of enclosure and shall be 6" (152 mm) high. Interior ceiling shall be 3/4" thick plywood laminated with .063" (1.6 mm) aluminum.

Canopy options shall include:

a. Exterior roof fabricated from .090" (2 mm) anodized aluminum.

b. Two ceiling lights with energy efficient lighting systems with flush lens.

E. PANEL/DOOR WING: Shall be aluminum, 1-3/4" (44 mm) deep with narrow stile construction. Perimeter weather-stripping utilizing affixed sweeps shall ensure weatherseal. An intermediate surface applied horizontal flat aluminum pushbar, 3/8" (10 mm) thick x 1 ½" (38 mm) wide, shall be furnished for each wing for safety.

Door Wing options shall include:

1. Stainless Steel flat pushbars.

2. Optional bottom rails: 8” (203 mm)
3. Prep for glazing up to 1" (25 mm).

F. HARDWARE: Provided shall include:
1. Locks with five pin cylinders and concealed bolts provided on two door wings.
2. Bottom pivot/bearing: Surface mounted with no excavation below floor line required.
3. Center Shaft: 1-1/2” (38 mm) diameter steel shaft with connections to speed control and bottom pivot/bearing.

.

2.03 RELATED WORK REQUIREMENTS

A. ELECTRICAL: (for Speed Control and lighting). 120/240 VAC, single phase, 15 amp.

B. GLASS AND GLAZING: Glass stops, glazing vinyl and setting blocks for field glazing as per Safety Glazing standard ANSI Z97.1.2. General contractor to coordinate acquisition of glass, not already provided by manufacturer, in thickness and type in accordance with manufacturer's recommendations for prescribed design.
1. Door Wing Glazing: (provided by others) Glass up to 1" (25 mm) insulated. Refer to Section 08800, Glazing

3. Round Enclosure Glazing: (provided by factory) Curved safety glass in clear, 7/16” laminated glass. Enclosure glass to be blue tinted

2.04 MATERIALS, FINISHES AND FABRICATION

A. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:
1. Structural Drum/Enclosure Sections: Minimum 1/8" (3 mm) thickness.
2. Structural Panel/Door Wing Sections: Commercial grade.

B. FINISHES (for all exposed aluminum surfaces): Shall be one of the following:
1. 204-R1 Clear: Arch. Class 2 Clear Anodized Coating, AA-MI2C22A31.

C. DOOR WING CONSTRUCTION:
1. Corner block type with 3/16” steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets.
2. Weatherstripping material captured in extruded aluminum door panel. Surface applied self-adhesive weatherstripping not acceptable.

D. ENCLOSURE CONSTRUCTION: Butt joints, mechanically secured by means of screws and formed aluminum corner brackets.

PART III - EXECUTION

3.01 EXAMINATION

SITE VERIFICATION OF CONDITIONS: Installer must verify that base conditions previously installed under other sections are acceptable for product installation according to with manufacturer's instructions. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of work. Do not start work until all negative conditions are corrected in a manner acceptable to the installer and manufacturer.

3.02 INSTALLATION

A. GENERAL: Install door unit(s) plumb, level and true to line, without warp or rack of enclosure. Drum enclosure can be center connected to adjacent construction or 'throat connected' (at entry vertical rails). Allow for 1/4" shim space each side and at canopy. Anchor in place. Unit is free-standing with no additional support required. Adjacent construction not to bear down on revolving door.

B. DISSIMILAR MATERIALS: Comply with AAMA 101, Appendix Dissimilar Materials by separating aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points.

C. WEATHER-TIGHT CONSTRUCTION: Install enclosure with joint filler or gaskets and sealant. Coordinate installation with wall flashings and other components of construction.

D. ELECTRICAL: General or electrical contractor to install all wiring to optional equipment on a separate circuit breaker routed into canopy.

3.03 CLEANING, ADJUSTMENT AND PROTECTION

A. CLEANING: After installation, installer to take following steps:

1. Remove temporary coverings and protection of adjacent work areas.
2. Remove construction debris from construction site and legally dispose of debris.
3. Repair or replace damaged installed products.
4. Clean product surfaces and lubricate operating equipment for optimum condition and safety.

B. ADJUSTMENT: Installer to adjust operator and controls for optimum condition and safety.

C. ADVISE CONTRACTOR: of precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

SECTION 08441 GLAZED ALUMINUM CURTAIN WALLS

PART 1 – GENERAL

1.01 Summary

A. Section Includes: Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.

1.02 Basis of design: Kawneer Aluminum Curtain Wall 1600 Wall System 1–, outside glazed pressure plate format.

1.03 System Description

A.Curtain Wall System Performance Requirements:

1. Wind Speed – 90 mph
2. Exposure Category – B
3. Building Category – 111
4. Building Enclosure – Enclosed
5. Importance Factor – 1.15
6. Ground snow load – 42.5 psf

7. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 (0.3 l/s · m^2) at a static air pressure differential of 6.24 psf (300 Pa).
8. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
9. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
10. Uniform Load: A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
11. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement.
12. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.66.
13. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 66_{frame} and 60_{glass} (clear),
14. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.43.
15. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 71_{frame} and 71_{glass} (HP glass).
16. Sound Transmission Loss: When tested to ASTM E90 and ASTM E1425, the Sound Transmission Class (STC) and Outdoor/Indoor Transmission Class (OITC) shall not be less than: STC 31 or OITC 26 based upon 1” insulating glass (1/4", 1/2" AS, 1/4"),

1.04 Submittals

A. General: Prepare, review, approve, and submit specified submittals in accordance with “Conditions of the Contract” and Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in “Conditions of the Contract.”

B. Quality Assurance/Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.05 Warranty

A. Project Warranty: Refer to “Conditions of the Contract” for project warranty provisions.

B. Manufacturer’s Product Warranty: Submit, manufacturer’s warranty for curtain wall system as follows: Warranty Period: Two (2) years from Date of Substantial Completion of the project.

1.06 Quality Assurance

A. Qualifications:

1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.

2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.
B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.07 Delivery, Storage, and Handling

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after curtain wall installation.

PART 2 – PRODUCTS

2.01 Manufacturers

A. The basis for the design is the Kawneer Aluminum Curtain Wall, Series: 1600 Wall System 1

B. Substitutions:

1. General: Refer to Substitutions Section for procedures and submission requirements.
a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (7) days prior to bid date.
2. Substitution Documentation
a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum curtain wall for a period of not less than ten (10) years. (Company Name)
c. Test Reports: Submit test reports verifying compliance with each test requirement for curtain wall required by the project.
d. Product Sample and Finish: Submit product sample, representative of curtain wall for the project, with specified finish and color.
3. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.02 Materials

A. Aluminum (Curtain Wall and Components):

1. Material Standard: Extruded Aluminum, ASTM B 221, 6063-T6 alloy and temper.
2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirements.
3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 Accessories

A. Fasteners: Where exposed, shall be Stainless Steel.
B. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.
C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
D. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides for silicone adhesion.
F. SunShade: Versoleil 1600SS, 36" depth with rounded end and Airfoil blades. Aluminum sunshade (consisting of outriggers, louvers, and fascia), shall be anchored directly to the vertical curtain wall mullions. Color to be Clear Anodic Coating (Color #17 Clear)

.

2.04 Related Materials

A. Sealants: Refer to Joint Treatment (Sealants) Section.
B. Glass: Refer to Glazing Section 08800.

2.05 Fabrication

A. General:
   1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
   2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
   3. Prepare components to receive anchor devices. Fabricate anchors.
   4. Arrange fasteners and attachments to conceal from view.

2.06 Finishes

A. Shop Finishing:
   AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear)

2.07 Source Quality Control

A. Source Quality: Provide aluminum curtain walls specified herein from a single source.

1. Building Enclosure System: When aluminum curtain wall are part of a building enclosure system, including entrances, entrance hardware, windows, storefront framing and related products, provide building enclosure system products from a single source manufacturer.

PART 3 – EXECUTION

3.01 Examination

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
   1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 Installation

A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
   1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
   2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" on center.
   3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.
   B. Related Products Installation Requirements:
      1 .Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
      2. Glass: Refer to Glazing Section 08800
   a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual

3.03 Field Quality Control

A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
   1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
      a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, which ever is greater.
      b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.04 Protection and Cleaning

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
B. Cleaning: 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 debris.

END OF SECTION 08441

SECTION 08443 SLOPED GLAZING ASSEMBLIES

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Sloped Glazing Systems, including perimeter trims, accessories, shims and anchors, and perimeter sealing of sloped glazed framing.

1. Basis of Design:

a. Kawneer 1600 S.G. (Sloped Glazing) –outside glazed pressure plate system. The width, depth and reinforcing of framing members shall be determined by the Sloped Glazing manufacturer, based on the required performance criteria.

1. Wind Speed – 90 mph
2. Exposure Category – B
3. Building Category – 111
4. Building Enclosure – Enclosed
5. Importance Factor – 1.15
6. Ground snow load – 42.5 psf
7. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft2 (.0003 $m^3/s\text{-}m^2$) at a static air pressure differential of 6.24 PSF (300 Pa).
8. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 PSF (575 Pa) as defined in AAMA 501.
9. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 PSF (575 Pa) as defined in AAMA 501.
10. Uniform Load: A static air design load of 40 PSF (1916 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
11. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.46 . Refer to Section 08800, Glazing, for specific glazing requirments.
12. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 68_{frame} and 66_{glass} (clear),

1.04 Submittals

A. General: Prepare, review, approve, and submit specified submittals and Shop Drawings in accordance with "Conditions of the Contract" and Submittals Sections. Sloped Glazing manufacturer shall provide shop drawings which are stamped and sealed by a professional engineer, and show all final sizes of framing members and all required reinforcing. All reinforcing is to be provided by the Sloped Glazing manufacturer.

B. Quality Assurance/Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.05 Warranty

Manufacturer's Product Warranty: Submit,manufacturer's warranty for sloped glazing system as follows:

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project .

1.06 Quality Assurance

A. Qualifications:

1. Installer Qualifications: Installer experienced to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.07 Delivery, Storage, and Handling

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle sloped glazing material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after sloped glazing installation.

PART 2 - PRODUCTS

2.01 Manufacturers

A. Basis of design:
   a. Kawneer Aluminum Sloped Glazing
   b. Series: 1600 S.G. (Sloped Glazing)
   c. Framing Member Profile: to be determined by Sloped Glazing manufacturer in order to meet design criteria.

B. Substitutions:
   1. General: Refer to Substitutions Section for procedures and submission requirements.
      a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (7) days prior to bid date.

2. Substitution Documentation
   a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
   b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for sloped glazing system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum sloped glazing for a period of not less than ten (10) years. (Company Name)
   c. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
   d. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

3. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.02 Materials

A. Aluminum (Sloped Glazing and Components):
   1. Material Standard: ASTM B 221; 6063-T6 alloy and temper
   2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
   3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of sloped glazing members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 Accessories

A. Fasteners: Where exposed, shall be Stainless Steel.
B. Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM, TPV or equal.
C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
D. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible PVC (Poly Vinyl Chloride).

2.04 Related Materials

A. Sealants: Refer to Joint Treatment (Sealants) Section.
B. Glass: Refer to Glass and Glazing Section.

2.05 Fabrication

A. General:

1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
3. Prepare components to receive anchor devices. Fabricate anchors.
4. Arrange fasteners and attachments to conceal from view.

2.06 Finishes

A. Factory Finishing:

1. AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear)

2.07 Source Quality Control

A. Source Quality: Provide aluminum sloped glazing specified herein from a single source.

1. Building Enclosure System: When aluminum sloped glazing is part of a building enclosure system, including entrances, entrance hardware, windows, storefront framing and related products; provide building enclosure system products from a single source manufacturer.

PART 3 - EXECUTION

3.01 Examination

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive sloped glazing system and sill is level in accordance with manufacturer's acceptable tolerances.

1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 Installation

A. General: Install sloped glazing systems plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.

1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the rafters using stainless steel fasteners.
3. Water Drainage: Water shall be typically diverted to the rafters and exit to the exterior of the building through weeps in the baffle and gutter. Typical horizontal covers and pressure plates will not require weep holes.
4. All curb construction to support sloped glazing is to be designed by the architect and building engineer to be rigid with negligible deflection (either horizontally or vertically) under design loads.

B. Related Products Installation Requirements:

1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
2. Glass: Refer to Glazing Section 08800.

a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.03 Field Quality Control

A. Field Tests: Architect shall select sloped glazing units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer’s representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.

a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft2, which ever is greater.

b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 PSF (383 Pa).

B. Manufacturer’s Field Services: Upon Owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.04 Protection and Cleaning

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum sloped glazing system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: 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 debris.

END OF SECTION 08443

SECTION 08630 - METAL FRAMED SKYLIGHTS

PART 1 GENERAL

1.01 DESCRIPTION

A. **Scope**
The work involves the furnishing and installing of the skylights, as indicated on the Contract Drawings. :

- Dome skylight at main entry
- Two (2) ridge-type skylights over the Atrium

B. **Work Included**
Engineering, fabrication and installation of the Skylight frames and glass. Furnishing and installing of the metal flashing directly related to the Skylight work. Roof curbs, roof flashing and wood blocking are not part of this Section.

1.02 SUBMITTAL

A. **Shop Drawings**
Submit 3 sets of Shop Drawings for the Architect's approval prior to commencing fabrication. Drawings shall be to a minimum scale of 1/8" = 1'-0" except for details which shall be full size.

B. **Structural Calculations**
Furnish structural calculations by a licensed engineer. The Skylight(s) shall be designed to meet the governing Building Code or loading conditions. Minimum strength and capacity of the skylight system shall meet the following:

1. Ground snow load is 42.5 psf.
2. Windspeed 90 mph, exposure B
3. Importance factor of 1.15

C. **Test Results**
Furnish Test Results certified by an independent testing laboratory conforming in full compliance with AAMA Standard 501-83 for Air Infiltration, Water Penetration and Structural Loading per ASTM E-283, E-330 and E-331 testing methods.

D. **Samples**
Submit 1 sample of each type of glass and finish.

1.03 WARRANTY

A. **Skylight(s)**
Prior to final payment this Subcontractor shall furnish the Owner with a written warranty certifying that the installation shall be free of defects in framing materials and workmanship for a period up to ten (10) years from the date of skylight completion.

B. **Glass**
The glass panels shall be warranted against color deterioration, seal failure and any manufacturing defects per the standard warranty of the glass manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. The Contract Drawings and Specifications are based upon the product(s) of: Imperial Glass Structures Company, 2120 South Foster Ave., Wheeling, IL 60090

B. Other manufacturers may request approval by submitting the following information not less than 7 days prior to the Bid:
    1. Comprehensive details as applicable to this project.
    2. Structural calculations based on the design criteria (per Paragraph 1.02 B above) indicating the adequacy of the Substitute manufacturer's system.
    3. Complete specifications.
    4. Ten (10) year Product Warranty.
    5. A list of at least five (5) installations with references, similar in type and magnitude, completed within the past five (5) years.
    6. A statement warranting that the manufacturer has specialized in aluminum glass glazed custom skylight systems for at least 20 continuous years.

2.02 MATERIALS

A. **Aluminum Frame**
All supporting members shall be extruded aluminum tubular type, 6063-T6 alloy and temper, and shall include integral condensate control channels located just below the glass line. Tubular members having condensate channels located at the midpoint or bottom of the members shall be unacceptable. All purlin to rafter and girt to column connections shall be concealed internal sleeve type. Exterior mullion caps shall include snap-in strips for concealing exterior fasteners.

B. **Glazing Strips**
The glass supporting and gasketing shall be extruded dense neoprene, minimum 1/8" face clearance, and shall have the following minimum characteristics:
    1. Hardness: (Shore A) 55 +/- 5 durometer.
    2. Tensile Strength: 2,000 psi.
    3. Elongation: 450%

C. **Fasteners**
Exterior fasteners shall be stainless steel. All internal fasteners and anchors shall be zinc or cadmium plated.

D. **Sealant**
The sealant shall be silicone and shall be applied in accordance with the manufacturer's recommendations.

E. **Flashing** shall be aluminum .040 minimum thickness.

F. **Finish:** Clear anodized aluminum

G. **Glass** – Refer to Glazing Section 08800

2.03 FABRICATION

A. All rafters and purlin members shall be rectangular tubes with condensate control channels located immediately below the glass line in order to insure flush, unbroken surfaces at the bottoms and midpoints.

B. The extruded aluminum curb member shall be insulated, if required, featuring concealed exterior fasteners.

C. All purlin to rafter and girt to column connections shall be internal type. Fasteners shall be concealed to the greatest extent possible. Exposed clips, plates and connectors shall be unacceptable.

D. The Skylight shall be of thermally improved design.

E. All exterior cap members shall incorporate snap-in glazing strips for concealing exterior fasteners. Glass panels and exterior cap members shall not come into contact with interior metal surfaces.

F. The finish aluminum components shall be applied after, not before, fabrication.

G. The Skylight(s) shall incorporate proper condensate control and weep system.

PART 3 EXECUTION

3.01 INSPECTION

A. This Subcontractor shall insure that the structure upon which the Skylight(s) are installed is properly prepared.
B. Should the underlying structure be defective in any respect, this Subcontractor shall notify the General Contractor. Skylight installation shall be suspended pending the correction of the defective work to the satisfaction of the this subcontractor.

3.02 PREPARATION

1. Aluminum members coming into contact with dissimilar materials shall receive a protective coating to prevent electrolysis.

3.03 INSTALLATION

A. The installation shall be performed by the Skylight manufacturer or their factory authorized representative.
B. All work shall be plumb, level and true to line, and shall be in full conformity with approved Shop Drawings.
C. Glass panels shall be installed in conformance with the standards and recommendations of the glass manufacturer.
D. All skylight surfaces shall be cleaned of sealant, dirt and other substances at time of installation. Protection and final cleaning of completed work is the responsibility of the General Contractor.

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.

1. Door hardware for steel (hollow metal) doors.
2. Door hardware for aluminum doors.
3. Door hardware for wood doors.
4. Door hardware for other doors indicated.
5. Keyed cylinders as indicated.

B. Related Sections:

1. Division 6: Rough Carpentry.
2. Division 8: Aluminum Doors and Frame
3. Division 8: Hollow Metal Doors and Frames.
4. Division 8: Wood Doors.
5. Division 8: Automatic Door Operators
6. Division 26 Electrical
7. Division 28: Electronic Security

C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.

1. Builders Hardware Manufacturing Association (BHMA)
2. NFPA 80 -Fire Doors and Windows
3. ANSI-A156Various Performance Standards for Finish Hardware
4. UL10C – Positive Pressure Fire Test of Door Assemblies
5. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
6. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
7. IBC – International Building Code

D. Alternates

1. Refer to Division 1 for Alternates and procedures.

1.2 SUBSTITUTIONS:

A. Comply with Division 1.

1.3 SUBMITTALS:

A. Comply with Division 1.

B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

C. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.

1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.

F. Samples: (If requested by the Architect)

1. 1 sample of Lever and Rose/Escutcheon design, (pair).
2. 3 samples of metal finishes

G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.

1. Operating and maintenance manuals: Submit 3 sets containing the following.

    a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Name, address, and phone number of local representative for each manufacturer.
    d. Parts list for each product.

2. Copy of final hardware schedule, edited to reflect, "As installed".
3. Copy of final keying schedule
4. As installed “Wiring Diagrams” for each piece of hardware connected to power, both low voltage and 110 volts.
5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.4 QUALITY ASSURANCE

A. Comply with Division 1.

1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.

    a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
    b. Hardware Schedule shall be prepared and signed by an AHC.

4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.

    a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
    b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.

6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Division 1.

1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Package hardware to prevent damage during transit and storage.
3. Mark hardware to correspond with "reviewed hardware schedule".
4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.6 PROJECT CONDITIONS:

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.7 WARRANTY:

A. Refer to Conditions of the Contract

B. Manufacturer's Warranty:

1. Closers: Ten years
2. Exit Devices: Five Years
3. Locksets & Cylinders: Three years
4. All other Hardware: Two years.

1.8 OWNER'S INSTRUCTION:

A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

A. Extra Service Materials: Deliver to Owner 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.

1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

Item:	Manufacturer:	Approved:
Hinges	Stanley	Bommer, Hager
Continuous Hinges	Stanley	Select, Zero
Locksets	Best	Schlage, Sargent
Cylinders	Best	Schlage, Sargent
Exit Devices	Precision	Von Duprin, Sargent
Closers	Stanley	LCN , Sargent
Push/Pull Plates	Trimco	Ives Rockwood
Push/Pull Bars	Trimco	Ives, Rockwood
Protection Plates	Trimco	Ives Rockwood
Overhead Stops	ABH	Rixson, Glynn Johnson
Door Stops	Trimco	Ives, Rockwood
Flush Bolts	Trimco	Ives,Rockwood

Threshold & Gasketing	National Guard	Reese, Zero
Sliding Door Hardware	Stanley	Grant/ Johnson

2.2 MATERIALS:

A. Hinges: Shall be Five Knuckle Ball bearing hinges

1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.
6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door
11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.
16. Acceptable Manufacturers:
    a. Stanley FBB179/FBB191 series
    b. Bommer BB5000/BB5001 series
    c. Ives:5BB1/ 5BB1HW series

B. Geared Continuous Hinges:

1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3 hour Fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees
8. Acceptable Manufacturers:
    a. Stanley : 661HD series
    b. Select: SL24HD series
    c. Zero: 914 DB AA series

C. Mortise Type Locks and Latches:

1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel

7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset.
19. Acceptable Manufacturers:
    a. Best: 45H series x 14H lever design
    b. Schlage: L9000 sereis x 17A lever design
    c. Sargent: 8200 series x LNP lever design
20. Electronic lock series 45HW; lock function as listed in Door Hardware.

D. Exit Devices shall:

1. Tested and approved by BHMA for ANSI 156.3, Grade 1
2. Provide 9001-Quality Management and 14001-Environmental Management.
3. Furnish UL or recognized independent laboratory certified mechanical operational testing to 9 million cycles minimum.
4. Provide a deadlocking latchbolt
5. Non-fire rated exit devices shall have cylinder dogging.
6. Touchpad shall be “T” style
7. Exposed components shall be of architectural metals and finishes.
8. Lever design shall match lockset lever design
9. Provide strikes as required by application.
10. Fire exit devices to be listed for UL10C
11. UL listed for Accident Hazard
12. Shall consist of a cross bar or push pad, the actuating portion of which extends across, shall not be less than one half the width of the door leaf.
13. Aluminum vertical rod assemblies are acceptable only when provide with the manufacturers optional top and bottom stainless steel rod guard protectors.
14. Acceptable Manufacturers:
    a. Precision: 2000 Apex Series
    b. Sargent: GL-19-80 series
    c. Von Duprin: 98 series

E. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions

9. Full rack and pinion type closer with 1½“ and 1 ¼” minimum bore as scheduled.
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.
12. Acceptable Manufacturers:
    a. Stanley: CLD3551/CLD4551 series
    b. LCN: 4040XP/ 4031 series
    c. Sargent: 281/ 1431 series

F. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.

1. Wall stop shall be wrought stainless steel.
2. Provide fastener suitable for wall construction.
3. Coordinate reinforcement of walls where wall stop is specified.
4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered
5. Acceptable Manufacturers:
    a. Trimco: 1270WV series
    b. Ives: WS407CCV series
    c. Rockwood: 409 series

G. Over Head Stops: Provide a Surface mounted overhead stop when a floor or wall stop cannot be used or when listed in the hardware set.
1. Surface overhead stops shall be heavy duty bronze or stainless steel.
2. Acceptable Manufacturers:
    a. ABH: 4400 series
    b. Glynn Johnson: 450 series
    c. Rixson: 10 series

H. Push Plates: Provide with four beveled edges ANSI J301, .050 thickness, size as indicated in hardware set. Furnish oval-head countersunk screws to match finish.
1. Acceptable Manufacturers:
    a. Trimco: 1001-3 series
    b. Ives: 8200 series
    c. Rockwood: 70C series

I. Pulls with plates: Provide with four beveled edges ANSI J301, .050 thickness Plate s with ANSI J401 Pull as listed in hardware set. Provide proper fasteners for door construction.
1. Acceptable Manufacturers:
    a. Trimco: 1018-3B series
    b. Ives: 8303 series
    c. rockwood: 111 x70C series

J. Push Pull Bars: Provide ANSI J504, .1” Dia. Pull and push bar model and series as listed in hardware set. Provide proper fasteners for door construction.
1. Acceptable Manufacturers:
    a. Trimco: 1191-3 series
    b. Ives 8190-10 series
    c. Rockwood: BF157 series

K. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
   1. Acceptable Manufacturers:
      a. Trimco: KO050 series
      b. Ives: 8400 series
      c. Rockwood: K1050 series

L. Door Bolts: Flush bolts for wood or metal doors.
   1. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
   2. Acceptable Manufacturers:
      a. Trimco: 3913/3917 series
      b. Ives: FB358/FB458 series
      c. Rockwood: 557/555 series
   3. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.
   4. Acceptable Manufacturers:
      a. Trimco: 3910 series
      b. Ives: DP2 series
      c. Rockwood: 570 series

M. Power Supply: Provide power supply for (ELR) Electric Latch Retraction exit devices

   1. Motherboard will accept up to four plug-in Control Modules. Provide the appropriate necessary control module to operate the number of ELR exit devices used at each opening. The Control Module shall include a Time delay Feature, variable (0-4 minutes) latch retraction period in response to a momentary input.
   2. UL Listed for class II output
   3. Include circuit breakers for protection of motherboard
   4. 115 or 230 Volt user selectable switch, with AC input= 115 Volt at 1 Amp
   5. Control module shall include Fire alarm terminal and Auxiliary contacts for remote signaling.
   6. Acceptable Manufacturers:
      a. Precision : ELR 150 series
      b. Von Suprin: PS914-2RS series
      c. Sargent: 3500 series

N. Quick Connect Power Transfer: Power transfer device shall be a steel housing and flexible tube. Secure and inconspicuous channel is to bring power from the frame to the door.
   1. Precision EPT-12C
   2. Tube shall contain 12 Wire bundle with Stanley Quick Connect Connectors one 4 wire connector consisting of two 18AWG wires and 2 24AWG wires and one 8 wire connector with 8 24AWG wires.

O. Electric Strike: Certified by ANSI/BHMA 156.31, Grade 1. and listed for Burglary Protection ANSI/ UL1034 Grade 1.

   1. For General use provide fail-secure electric strike.

2. Listed UL10C for Fire Door assemblies
3. Entry Buzzer option when specified in hardware sets.
4. Provide the electric strike in the appropriate model that will accept a 3/4" latchbolt.
5. Acceptable Manufacturers:
   a. Von Duprin: 6210EB series

P. Door Position Switch: Provide door position switch for door status monitoring as indicated in hardware sets.

1. At all fired rated doors the door and frames, position switch preparation will be provided by the door and frame manufacturer or by an authorized label service agent.

Q. Quick Connect plug-in connectors: Stanley quick connect plug-in must be used with a combination of the following components to work as a complete plug and play system.
1. Best locks series 45HW, 45HM, 8KW, 9KW, 9KM
2. To include Quick connectors to Best lock products Suffix “C” Example (45HW-7DEL14H DS **C)**
3. Precision Exit Devices 2000 Series, DE, DS, TS, TDS, LDS, ELR
4. To include Quick connectors to Precision Electric Exit device products Prefix “C” Example (**C** ELR 2108 x V4908A TS**)**
5. Precision 12 Conductor Electric Power Transfer EPT-12C
6. Stanley 12 Hinges Conductor Hinge CECB179-12C

R. Quick Connect Wire Harnesses: The Quick Connect wire harness shall have of one four wire connector and one eight wire connector. The four wire connector has two 18AWG and two 24AWG wires. The eight wire connector has eight 24AWG wires Stanley quick connect wire harnesses are available in various length’s, 3” (76mm), 6” (152mm), 12” (304mm), 26” (660mm) 32” (812mm) 38” (965mm), 44” (1117mm), 50” (1270mm) and 192” (4876mm).
1. Wire Harness that is terminated at both ends is specified as WH-size (Example WH-3).
2. Wire Harness that is terminated at one end with exposed pin head at the other is specified as WH-size P (Example WH-3P).

S. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
1. Acceptable Manufacturers:
   a. National Guard Products: 5050 series
   b. Reese: 797 series
   c. Zero: 188 S series

T. Door Bottoms/Sweeps/ Astragal Seals: Surface mounted door bottom where listed in the hardware sets.

1. Door seal shall be resilient seal of Nylon Brush.
2. UL10C Positive Pressure rated seal set when required.
3. Acceptable Manufacturers:
   a. National Guard Products: 220S/C627/672 series
   b. Reese: 521/354/129 series
   c. Zero:365AA/8198AA/8193AA series

U. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½" for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
   1. Acceptable Manufacturers:
      a. National Guard Products: 426/896/950 series
      b. Reese: S426A/S483A/S257A series
      c. Zero: 656A/65A/566A series

V. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.
   1. Acceptable Manufacturers:
      a. Trimco: 1229A series
      b. Ives SR64 series
      c. Rockwood: 608 series

2.3 FINISH:

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.4 KEYS AND KEYING:

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

B. Cylinders, removable and interchangeable core system:
   1. Acceptable Manufacturers:
      a. Best CORMAX™ patented key system
      b. Schlage: Everest 29 patented key system
      c. Sargent: DG2 patented key system

C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.

E. Furnish keys in the following quantities:

1. 1 each Grand Masterkeys
2. 4 each Masterkeys
3. 2 each Change keys each keyed core
4. 15 each Construction masterkeys
5. 1 each Control keys

F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.

G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.

1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).

2. Recommended locations for Architectural Hardware for flush wood doors (DHI).

3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Conform to local governing agency security ordinance.

C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.

1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.

D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.

1. Check and adjust closers to ensure proper operation.

2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.

   a. Verify levers are free from binding.
   b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

SET #01

2	Continuous Hinge	661HD UL EPT Prep	AL	ST
2	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2601	630	PR
1	Exit Device	C ELR TS 2603	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Pull	1191-3	630	TR
2	Door Closer	CLD-4550 CS P45-180D	689	SD
1	Integral Seals By Frame Mfr.	INTEGRAL SEALS BY FRAME MFR.		B/O
1	Power Supply	ELR152		PR
1	Threshold	896 S	AL	NA
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Panic devices latchbolts are electrically dogged down during the day. Ingress is by pull on either door. After hours device latchbolts are projected locking doors. Presenting card to reader will unlock active door leaf allowing ingress. TS switch is a request to exit switch. Free egress from both doors at all times.

SET #02

1	Continuous Hinge	661HD UL EPT Prep	AL	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2403	630	PR

1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	1191-3	630	TR
1	Door Closer	CLD-4550 CS P45-180D	689	SD
1	Integral Seals By Frame Mfr.	INTEGRAL SEALS BY FRAME MFR.		B/O
1	Power Supply	ELR151		PR
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O
1	Saddle Threshold	426	AL	NA

NOTE: Door is normally closed and unlocked. During the day the latchbolt of the ELR device is electrically held retracted. Ingress is by pulling door open. After hours, door is closed and locked. Presenting card to reader will unlock door allowing ingress. TS designates a request to exit switch. Free egress at all times.

SET #02A

1	Continuous Hinge	661HD UL EPT Prep	AL	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2403	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	1191-3	630	TR
1	Auto-Operator	MAGIC-FORCE	689	STAN
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		BY
1	Power Supply	ELR151		PR
1	Integral Seals By Frame Mfr.	INTEGRAL SEALS BY FRAME MFR.		B/O
1	Saddle Threshold	426	AL	NA
2	Actuator Button	ACTUATOR BUTTON	630	STAN

NOTE: Door is normally closed and unlocked. During the day the latchbolt of the ELR device is electrically held retracted.Pushing on actuators will open door automatically. After hours, door is closed and locked. Presenting card to reader will unlock door allowing ingress. TS designates a request to exit switch. Auto operator may be turned on or off with integral switch.Free egress at all times.

SET #03

1		ALL HARDWARE BY DOOR MFR.	B/O

SET #04

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Exit Device	2801	630	PR
1	Exit Device	2803 X 4903D	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	CLD-4551 HCS	689	SD
2	Door Silencers	1229A	GREY	TR

SET #05

3	Hinges	FBB191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-4550 CS	689	SD
1	Gasketing	5050C Head & Jambs		NA
1	Door Sweep	C627 A		NA
1	Saddle Threshold	426 36"	AL	NA

SET #06

6	Hinges	FBB191 4 1/2 X 4 1/2 NRP	US32D	ST
2	Power Transfer	EPT-12C		PR
1	Exit Device	C FL TS 2801	630	PR
1	Exit Device	C ELR FL TS 2803	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Pull	1191-3	630	TR
2	Door Closer	CLD-4550 CS	689	SD
1	Astragal Set	672 A (SET)		NA
1	Gasketing	5050C Head & Jambs		NA
1	Door Sweep	C627 A		NA
1	Threshold	896 S	AL	NA
1	Power Supply	ELR151		PR
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Doors are normally closed and locked.Presenting card to reader will unlock active door leaf allowing ingress.TS designates a request to exit switch. Free egress from both doors at all times.

SET #07

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-3551 HCS	689	SD
3	Door Silencers	1229A	GREY	TR

SET #08

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Flush Bolt	3917-12	626	TR
1	Dustproof Strike	3910	630	TR
1	Storeroom Lockset	45H-7D14H PATD	626	BE
2	Door Closer	CLD-3551 HCS	689	SD
2	Door Silencers	1229A	GREY	TR

SET #09

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
2	Flush Bolt	3913	626	TR

1	Dustproof Strike	3910	630	TR
1	Storeroom Lockset	45H-7D14H PATD	626	BE
2	Door Closer	CLD-3551 HCS	689	SD
2	Door Silencers	1229A	GREY	TR

SET #10

2	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Electric Hinge	CECB179-12C 4 1/2 x 4 1/2	US26D	ST
1	Electro-mech Lock	45HW-7TDEU14H PATD C RQE	626	BE
1	Door Closer	CLD-3551 H	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR
1	Wire Harness	WH-192		BE
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O
1	Power Supply	POWER SUPPLY BY OWNER"S SECURITY VENDOR		B/O

NOTE: Door is normally closed and locked. Presenting card to reader will unlock door allowing ingress. Lockset will fail secure (remain locked) in the event of a power outage. Free egress at all times.

SET #11

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Exit Device	2108 X 4908D	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Closer	CLD-4551 HCS	689	SD
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
3	Door Silencers	1229A	GREY	TR

SET #12

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Pull Plate	1018-3B	630	TR
1	Push Plate	1001-3	630	TR
1	Door Closer	CLD-4551 STD W/PA BRKT	689	SD
1	Wall Bumper	1270WX	630	TR
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
3	Door Silencers	1229A	GREY	TR

SET #13

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Passage Set	45H-0N14H	626	BE
1	Door Closer	CLD-3551 H	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #14

3	Hinges	FBB191 4 1/2 X 4 1/2	US32D	ST
1	Pull Plate	1018-3B	630	TR
1	Push Plate	1001-3	630	TR
1	Door Closer	CLD-4551 S	689	SD
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
3	Door Silencers	1229A	GREY	TR

SET #15

3	Hinges	FBB168 5 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-4551 S	689	SD
1	Gasketing	5050 C Head & Jambs		NA
1	Auto Door Bottom	220 SA		NA
1	Threshold	950 S	AL	NA

SET #16

5	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Electric Hinge	CECB179-12C 4 1/2 x 4 1/2	US26D	ST
1	Flush Bolt	3917-12	626	TR
1	Dustproof Strike	3910	630	TR
1	Electro-mech Lock	45HW-7TDEU14H PATD C RQE	626	BE
2	Door Closer	CLD-3551 H	689	SD
2	Wall Bumper	1270WX	630	TR
2	Door Silencers	1229A	GREY	TR
1	Wire Harness	WH-192		BE
1	Power Supply	POWER SUPPLY BY OWNER"S SECURITY VENDOR		B/O
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Doors are normally closed and locked. Presenting card to reader will unlock active door leaf allowing ingress. Lockset will fail secure(remain locked) in the event of a power outage. Free egress at all times.

SET #17

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Fire Exit Device	FL 2114 X 4914D	630	PR
1	Door Closer	CLD-4551 STD W/PA BRKT	689	SD
1	Wall Bumper	1270WX	630	TR
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
1	Gasketing	5050C Head & Jambs		NA

SET #18

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Flush Bolt	3913	626	TR
1	Dustproof Strike	3910	630	TR
1	Storeroom Lockset	45H-7D14H PATD	626	BE
2	Overhead Holder	4412	US26D	AB
2	Door Silencers	1229A	GREY	TR

SET #19

2	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Electric Hinge	CECB179-12C 4 1/2 x 4 1/2	US26D	ST
1	Electro-mech Lock	45HW-7TDEU14H PATD C RQE	626	BE
1	Door Closer	CLD-3551 S	689	SD
3	Door Silencers	1229A	GREY	TR
1	Wire Harness	WH-192		BE
1	Power Supply	POWER SUPPLY BY OWNER"S SECURITY VENDOR		B/O
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

City Hall

NOTE: Door is normally closed and locked. Presenting card to reader will unlock door allowing ingress. Lockset will fail secure (remain locked) in the event of a power outage. Free egress at all times.

SET #20

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Classroom Lockset	45H-7R14H PATD	626	BE
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #21

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2103 X 4903D	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Closer	CLD-4551 S	689	SD
3	Door Silencers	1229A	GREY	TR
1	Power Supply	ELR151		PR
1	Push Button Switch	8WBU-1-N		BE
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Door is normally closed and locked. Presenting card to reader or depressing pushbutton in Reception will unlock door allowing ingress. Free egress at all times.

SET #22

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2103 X 4903D	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Closer	CLD-4551 S	689	SD
3	Door Silencers	1229A	GREY	TR
1	Power Supply	ELR151		PR
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Door is normally closed and locked. Presenting card to reader will retract latchbolt of panic device allowing ingress by pulling door open. Free egress at all times.

SET #23

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Privacy Set	45H-0L14H	626	BE
1	Door Closer	CLD-3551 S	689	SD
3	Door Silencers	1229A	GREY	TR

SET #24 NOT USED

SET #25

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Passage Set	45H-0N14H	626	BE
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #26

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Double Storeroom Lockset	45H-7W14H PATD	626	BE
1	Door Closer	CLD-3551 STD W/PA BRKT	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #27

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	2403	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Pull	1191-3	630	TR
1	Door Closer	CLD-4550 CS P45-180D	689	SD
1	Integral Seals By Frame Mfr.	INTEGRAL SEALS BY FRAME MFR.		B/O
1	Saddle Threshold	426	AL	NA

SET #28

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-3551 HCS	689	SD
3	Door Silencers	1229A	GREY	TR

SET #29

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Power Transfer	EPT-12C		PR
1	Exit Device	C ELR TS 2103 X 4903D	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Door Closer	CLD-4551 S	689	SD
3	Door Silencers	1229A	GREY	TR
1	Power Supply	ELR151		PR
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Door is normally closed and locked. Presenting card to reader will retract latchbolt of panic device allwoing ingress. TS designates a request to exit switch. Free egress at all times.

SET #30

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Flush Bolt	3913	626	TR
1	Dustproof Strike	3910	630	TR
1	Storeroom Lockset	45H-7D14H PATD	626	BE
2	Door Closer	CLD-3551 HCS	689	SD
2	Door Silencers	1229A	GREY	TR

SET #31

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Exit Device	2201 LBR	630	PR
1	Exit Device	2208 X 4908D LBR	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
2	Door Closer	CLD-4551 CS	689	SD
2	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
2	Door Silencers	1229A	GREY	TR

SET #32

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-3551 H	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #33

1	Bi Fold Door Set	BF125N-00-72		STAN

SET #34

1	Pocket Track/Hardware	PDC150-00-36		STAN
1	Pocket Door Lock/ Pull	2002-CPDL-3	626	ACC
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Strike For Sgl. Door	SD	626	ACC
1	Flush Pull-Cylinder	02002C	626	ACC
1	Flush Pull	02002T	626	ACC

SET #35

2	Pocket Track/Hardware	PDC150-00-36		STAN
1	Bi-Parting Bracket	PD-250-05		STAN
1	Pocket Door Lock/ Pull	2002-CPDL-3	626	ACC
1	Strike/Pull	2002-CPDS	626	ACC
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Flush Pull	02002T	626	ACC
1	Flush Pull-Cylinder	02002C	626	ACC
2	Flush Pulls	02002B	626	ACC

NOTE: Bi- Parting Bracket used to connect the two pocket door tracks together.

SET #36

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Privacy Set	45H-0L14H	626	BE
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #37

1	Bi Fold Door Set	BF125N-00-36		STAN

SET #38

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Office Lockset	45H-7A14H PATD	626	BE
1	Door Closer	CLD-3551 S	689	SD
3	Door Silencers	1229A	GREY	TR

SET #39

3	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Electric Strike	6210 24VDC EB FSE	US32D	VO
1	Door Closer	CLD-3551 STD W/PA BRKT	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR
1	Push Button Switch	8WBU-1-N		BE
1	Power Supply	POWER SUPPLY BY OWNER"S SECURITY VENDOR		B/O
1	Card Reader	CARD READER BY OWNER'S SECURITY VENDOR		B/O

NOTE: Door is normally closed and locked. Presenting card to reader will signal electric strike to release lathbolt of lockset allowing ingress. Door may also be remotely unlocked by depressing pushbutton in Reception room. Electric strike will buzz when unlocked. Free egress at all times.

SET #40

3	Hinges	FBB191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-4550 CS	689	SD
1	Door Sweep	C627 A		NA
1	Gasketing	5050C Head & Jambs		NA
1	Saddle Threshold	426 36"	AL	NA
1	Door Position Switch	DPS-M-BK		SN

NOTE: Install lockset so that cylinder is on corridor 337 side. Free ingress from roof at all times. DPS switch will alert security if door has been used.

SET #41

1	Bi- Fold Hardware Set	BF125N-02-60 60"		STAN

SET #42

6	Hinges	FBB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Dustproof Strike	3910	630	TR
2	Flush Bolt	3917-12	626	TR
1	Storeroom Lockset	45H-7D14H PATD	626	BE
2	Door Closer	CLD-3551 HCS	689	SD
2	Door Silencers	1229A	GREY	TR

SET #43

3	Hinges	FBB168 5 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	45H-7D14H PATD	626	BE
1	Door Closer	CLD-3551 H	689	SD
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
1	Floor Stop	1211	626	TR
3	Door Silencers	1229A	GREY	TR

SET #44

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Office Lockset	45H-7A14H PATD	626	BE
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

City Hall

SET #45

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Exit Device	2114 X 4914D	630	PR
1	Door Closer	CLD-4551 STD W/PA BRKT	689	SD
1	Kick Plate	KO050 10" x 2" LDW CSK	630	TR
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

SET #46

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Office Lockset	45H-7A14H PATD	626	BE
1	Door Closer	CLD-3551 H	689	SD
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	GREY	TR

DOOR INDEX

Opening	Hdw Set
001	01
002	03
003	04
004	05
005	07
006	43
007	08
008	09
009	32
010	02
011	11
012	13
013	11
014	11
015	44
016	44
017	14
018	12
019	12
020	14
021	15
022	11
023	16
024	17
025	42
101	44
102	18
103	44
104	44
105	25
106	10
107	44
108	44
109	44
110	44
111	44
112	44
113	44
114	19
115	26
116	07
117	44
118	44
119	10
120	44
121	44
122	10
123	27
124	17
125	10
126	44
127	44
128	44

City Hall

129	28
130	32
131	12
132	12
133	32
134	02
135	02A
136	06
137	12
138	12
139	07
140	44
141	17
142	11
143	27
145	30
146	10
147	44
148	12
149	12
150	07
151	01
152	01
153	01
154	31
201	44
202	44
203	44
204	44
205	44
206	44
207	44
208	44
209	44
210	44
211	44
212	44
213	44
214	44
215	44
216	44
217	20
218	21
219	22
220	17
221	44
222	44
223	44
224	44
225	44
226	07
227	32
228	07
229	23
230	23
231	20
232	20

City Hall

233	12
234	12
235	29
236	07
237	13
238	17
239	44
240	28
241	44
242	44
243	44
244	32
245	32
246	44
247	44
248	44
249	44
250	33
251	10
252	44
301	44
302	44
303	44
304	44
305	44
306	20
307	44
308	44
309	44
310	44
311	44
312	44
313	07
314	20
315	29
316	07
317	17
318	20
319	07
320	36
321	44
322	36
323	44
324	36
325	44
326	44
327	37
328	36
329	41
330	38
331	44
332	45
333	32
334	29
335	40
336	12
337	12

City Hall

338	17
339	29
340	38
341	44
342	44
343	44
344	44
345	46
346	44
347	29
348	39
349	44
350	44
351	34
352	35
353	44
354	44
355	44
357	23
358	44
359	23
360	20

END OF SECTION

SECTION 08800 - GLAZING

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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Glazed Aluminum Curtainwalls
2. Sloped Glazing Assemblies
3. Interior Doors
4. Aluminum Framed Entrances
5. Interior view windows
6. Ridge type skylights
7. Dome skylight

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated and/or as required by code.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:
1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer's recommended standard spacer material and construction compatible with specified glass, frame and sealant.

2.6 FLASHING

A. Manufacturer's standard extruded sill flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
C. All first floor frames are to be glazed from the exterior.
D. All second and third floor frames are to be glazed from the interior.
E. Install manufacturer's standard extruded sill flashing at all storefront frames.

3.4 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.5 <u>GLAZING SCHEDULE</u>

A. **Interior doors, Interior view windows, Interior glass in aluminum or rolled steel frames**; Uncoated Clear Float Glass: 1/4" thick. Provide tempered glass in all locations.

B. **Glazed Aluminum Curtain Walls** (except Spandel panels);
Outdoor Lite - ¼" Azuria, tempered
Indoor Lite - ¼" clear Solarban 60 (No.3), tempered

C. **Curtain Wall Spandel glazing;** Outdoor Lite - ¼" clear, heat strengthened
Indoor Lite - ¼" clear Solarban 60 (No.4) blue tint, heat strengthened

D. **All Sloped Glazing**: Outdoor Lite - ¼" Azuria, tempered
Indoor Lite – 5/16" clear laminated, Solarcool reflective (No.3)

E. **Dome skylight**: 9/16" laminated glass (1/4" Solarcool reflective (No.2) - .060 interlayer - 1/4" clear)

F. **Ridge type skylights** (2 over Atrium): Outdoor Lite - 1/4" Solarcool azuria –
½"" air space
3/8" clear laminated

G. **Exterior Alum. Storefront doors**: Outdoor Lite - ¼" Azuria, tempered
Indoor Lite - ¼" clear Solarban 60 (No.3), tempered

END OF SECTION 08800

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.

2. Mullion Mate

B. Related Sections include the following:
1. Division 6 Section "**Rough Carpentry**" for wood framing and furring**, and gypsum sheathing applied over wood framing**.
2. Division 7 Section "**Building Insulation**" for insulation and vapor retarders installed in gypsum board assemblies.

1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products **by one** of the following:

1. Gypsum Board and Related Products:

a. American Gypsum Co.
b. G-P Gypsum Corp.
c. National Gypsum Company.
d. United States Gypsum Co.

2.2 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type:

a. Thickness: **As indicated on the drawings**
b. Long Edges: **Tapered**.
c. Location: **Vertical surfaces, unless otherwise indicated**.

2. Type X:

a. Thickness: **5/8 inch (15.9 mm)**.
b. Long Edges: **Tapered**.
c. Location: **Where required for fire-resistance-rated assembly**.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: **Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet**.
2. Shapes:

a. Cornerbead: Use at outside corners**, unless otherwise indicated**.

b. LC-Bead: J-shaped; exposed long flange receives joint compound; use [**at exposed panel edges**] <**Insert requirements**>.
c. Expansion (Control) Joint: Use **where required**.
d. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

2.4 JOINT TREATMENT MATERIALS

A. General: Joint Tape - Comply with ASTM C 475.

B. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints**, rounded or beveled panel edges,** and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use **setting-type taping compound**.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use **setting-type, sandable topping compound**.
4. Finish Coat: For third coat, use **setting-type, sandable topping compound or drying-type, all-purpose compound**.
5. Skim Coat: For final coat of Level 5 finish, use **drying-type, all-purpose compound**.

2.5 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

   a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
   b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
   c. Equal approved by Architect.

2. Acoustical Sealant for Concealed Joints:

   a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
   b. Pecora Corp.; BA-98.
   c. Tremco, Inc.; Tremco Acoustical Sealant.

2.6 SYSTEMS DESCRIPTION

A. Mullion Mate extruded aluminum partition closures are pre-assembled and spring loaded to provide a tight fit for vertical junctures of partitions and window walls. Mullion Mate is finished to match mullions in a spray applied water-borne cross-linked baked acrylic finish or Acrylic-Polyester hybrid powder coat paint finish or custom paints or anodized finish. They are sound tested to a 38 STC rating with optional acoustical batts for sound attenuation.

B. Aluminum extrusions: 6063-T5 temper, tensile strength 31 KSI (ASTM B 221, ASTM B 221 M). Specify **Mullion Mate 3**, or approved equivalent.

C. Accessories: Acoustical Batts for sound attenuation .

D. General: Provide metals free from surface blemishes where exposed to view in finished unit. Surfaces that exhibit pitting, seam marks, roller marks, stains, and discolorations, or other imperfections on finished units are not acceptable. All metal shall be of the highest-grade commercial type.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

F. Polyethylene Vapor Retarder: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building

structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

K. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.4 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels **vertically (parallel to framing**, unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of board.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.5 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints**, rounded or beveled edges,** and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated**, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies**.
2. **Level 5**: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface.

END OF SECTION 09260

SECTION 09300 TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile and Accessories:
1. ColorBody (through color) Porcelain.
2. Glazed Porcelain.
3. Porcelain Stone
4. Trim and Accessories.
5. Setting Materials.

1.2 RELATED SECTIONS

1.3 REFERENCES

A. American National Standards Institute (ANSI):
1. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
2. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
3. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
4. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
5. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
6. ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
7. ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
8. ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
9. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
10. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
11. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
12. ANSI A118.4 - Latex-Portland Cement Mortar.
13. ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.
14. ANSI A118.6 - Standard Ceramic Tile Grouts.
15. ANSI A118.7 - Polymer Modified Cement Grouts
16. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
17. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units
18. ANSI A118.10 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.
19. ANSI A118.11 - Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar.
20. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.

21. ANSI A137.1 - Specifications for Ceramic Tile.

B. ASTM International (ASTM):
1. ASTM C 50 - Standard Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products.
2. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
3. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C 241 - Standard Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.
5. ASTM C 503 - Standard Specification for Marble Dimension Stone.
6. ASTM C 615 - Standard Specification for Granite Dimension Stone.
7. ASTM C 629 - Standard Specification for Slate Dimension Stone.
8. ASTM C 847 - Standard Specification for Metal Lath.
9. ASTM C 1028 - Standard Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.
10. ASTM D 4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

C. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2007.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
1. Level Surfaces: Minimum of 0.6 (Wet).
2. Step Treads: Minimum of 0.6 (Wet).
3. Ramp Surfaces: Minimum of 0.8 (Wet).

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

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: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Samples of actual tiles for selection.

E. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.

F. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.
2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum seven years experience.

B. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.

1.9 EXTRA MATERIALS

A. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacture: DalTile Corporation,
Crossville Tile

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:

1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

B. Porcelain Tile:

Basis of Design:

Porcelain Tile #1 (PT-1) – Dal Tile “Concrete Connection” glazed porcelain tile, 13” x 13” x 3/8”. Color to be “Steel Structure”

Porcelain Tile #2 (PT-2) – Dal Tile “Diamante” through color porcelain tile, 24” x 24” x 3/8”, unpolished. Color to be “Bianco PO32”

Porcelain Tile #3 (PT-3) – Dal Tile “Yacht Club”, glazed porcelain tile, 6” x 24” x 3/8”. Color to be "Cockpit YC03”

Porcelain Tile #4 (PT-4) – Dal Tile “Concrete Connection”, glazed porcelain tile, 20” x 20” x 3/8”. Color to be “Steel Structure CN91”

Porcelain Tile #5 (PT-5) – Daltile “Concrete Connection” glazed porcelain tile, 20” x 20” x 3/8”. Color to be “Boulevard Beige CN90”

Porcelain Tile #6 (PT-6) – Dal Tile “Concrete Connection” glazed porcelain tile, 20” x 20” x 3/8”. Color to be “Plaza Rouge CN93”

Porcelain Tile #7 (PT-7) – Dal Tile “Concrete Connection” 20” x 20” x 3/8”. Color to be “City Elm CN 92”

Porcelain Stone Tile - Crossville “Bluestone” Porcelain Stone, in a mix of sizes of 6” x 24” and 6” x 6”. Refer to pattern shown on the drawings for accent wall in Stair #3. Pattern calls for a mix of three colors;
Vermont Black HON, Vermont Black UPS, Pennsylvania Blue HON and Pennsylvania Blue UPS

Patterns: As indicated on the Drawings.

1. Trim Units: Matching bullnose, cove base corner, cove base outcorner, jolly, grooved bullnose, cement bullnose, fabric bullnose, shapes in sizes coordinated with field tile.

2.3 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, for setting using tile mortar or adhesive; use in the following locations:
   1. Open edges of floor tile.
   2. Transition between floor finishes of different heights.
   3. Thresholds at door openings.
   4. Expansion and control joints in floor

2.4 SETTING MATERIALS

Provide setting materials as recommended by the tile manufacturer for the installation shown.

A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thinset bond type.

C. Mortar Bed Materials:

1. Portland cement: ASTM C150, type 1, gray or white.
2. Hydrated Lime: ASTM C207, Type S.
3. Sand: ASTM C144, fine.
4. Latex additive: As approved.
5. Water: Clean and potable.

D. Mortar Bond Coat Materials:
1. Dry-Set Portland Cement type: ANSI A118.1.
2. Latex-Portland Cement type: ANSI A118.4.
3. Epoxy: ANSI A118.3, 100 percent solids.

E. Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7; color as selected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install thresholds where indicated.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints. Use standard grout unless otherwise indicated.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.

B. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

3.5 CLEANING

A. Clean tile and grout surfaces.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways

END OF SECTION

SECTION 09512 - ACOUSTICAL TILE CEILINGS

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 acoustical tiles for ceilings and the following:

1. Acoustical panel ceiling system with suspended “T” grid.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For components with factory-applied color finishes.

C. Research/Evaluation Reports: For acoustical tile ceiling and components **and anchor type**.

D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class **A** materials as determined by testing identical products per ASTM E 84:

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 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. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 ACOUSTICAL TILE CEILING PANELS

A. Basis of design:
1. Armstrong “Dune, 1774” – 24” x 24” x 5/8”; angled Tegular, or approved equal. Color to be white.

2.4 METAL SUSPENSION SYSTEM

A. Provide manufacturers standard direct hung metal suspension system that complies with applicable ASTM C 635 requirements.

Grid size: 24” x 24”, 15/16” “T” grid, exposed
Color: White enamel
Standard of quality: “Prelude ML exposed” or approved equivalent

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with **ASTM C 636** and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09512

SECTION 09651 - RESILIENT FLOOR TILE

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. Rubber floor tile.
   2. Rubber stair treads and risers
   3. Vinyl composition tile (VCT).
   4. Resilient **wall base and/or accessories**.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than **70 deg F** or more than **95 deg F** , in spaces to receive floor tile during the following time periods:

   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than **55 deg F** or more than **95 deg F**.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

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. Floor Tile: Furnish 1 box for every **50** boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
2. Resilient **Wall Base and Accessories**: Furnish not less than **10 linear feet** for every **500 linear feet** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

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 listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

2.3 RUBBER FLOOR TILE

A. The Basis of design is Roppe "994 Raised Square" rubber floor tile, 12" x 12" x 1/8" thickness. Color to be selected from standard manufactures colors

2.4 VINYL TILE

A. The basis of design is Johnsonite Azrock Collection, 1/8" thickness. Refer to the floor pattern layout on the drawings for actual color selections.

B. Size: 12 by 12 inches (305 by 305 mm).

2.5 RESILIENT WALL BASE

A. Basis of design: Roppe Type TV thermoplastic vinyl base, 1/8" thickness, coved, 4" height. Corners to be premolded.

2.6 RUBBER STAIR TREADS AND RISERS

A. Basis of Design - Roppe - one-piece raised Vantage Design circular. Includes riser. Color to be selected from standard colors.

2.7 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft.** in 24 hours.
b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter. Lay in a non-directional herringbone pattern.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

a. Use commercially available product acceptable to manufacturer.
b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09651

SECTION 09680 - CARPET

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. Modular carpet

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

1.7 WARRANTY

A. Warranty:

Lifetime fiber performance for wear

Lifetime stain removal

Lifetime colorfastness to light and atmospheric contaminents

Lifetime protection from from delamination failure

Lifetime for tuft bind strength

Lifetime moisture barrier

Lifetime dimensional stability

Lifetime fiber performance for static

PART 2 - PRODUCTS

2.1 Materials and Performance:

A. Style – Modular, 24” x 24”

B. Dye method – Solution dyed

C. Construction – Pattern loop (Textured Loop, Cpt #4)

D. Gauge – 1/10 (1/8 for Cpt.#4)

E. Pattern repeat – Not applicable

F. Fiber type – 100% Encore SD Nylon (100% Encore SD Ultima Nylon, Cpt#4)

G. Backing· NSF/ANSI Standard 140 Gold Certified. Complies with CRI Green Label Plus™ requirements. High performance precoat for maximum tuft bind and delamination performance.·Thermoplastic technology with a fiberglass- reinforced layer. Average backing weight: 115-121 oz/yd.

H. Physical Testing:

Class I – flor radiant panel

Passes – Pill test

Smoke density – less than 450 flaming

Static generation – less than 3.0kv

ADA compliant – compliant for accessible routes

2.2 Basis of Design

Carpet #1 – J&J /Invision, Quick Fix line, color "Reboot 1209"

Carpet #2 – J&J /Invision, Quick Fix line, color "Superglue 1201"

Carpet #3 - J&J /Invision, Quick Fix line, color "Band-Aid 1205"

Carpet #4 - J&J /Invision, Catwalk walk-off modular, color "Strike a pose"

Substitutions – Any proposed substitution for the above specified carpets must be accompanied by a **side-by-side comparison, prepared by the company proposing the substitution**, of the specified material and performance characteristics, as compared to that of the proposed substitute. A substitute product **must meet or exceed** all aspects of the specified materials and performance.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the carpet manufacturer.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness

characteristics by performing bond and moisture tests recommended by the carpet manufacturer.

2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with carpet manufacturer's written recommendations for modular carpet installation.

Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

B. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

C. Provide at least 12 extra 2’ x 2’ carpet tiles of each color to the Owner for extra stock and replacement material.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 09680

SECTION 09912 - PAINTING (PROFESSIONAL LINE PRODUCTS)

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 surface preparation and field painting of exposed **exterior and interior** items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
   a. Acoustical wall panels.
   b. Finished mechanical and electrical equipment.
   c. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

   a. Foundation spaces.
   b. Furred areas.
   c. Pipe spaces.

3. Finished metal surfaces include the following:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
3. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
4. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
5. Division 8 Section "Wood Windows" for shop priming unclad wood windows.
6. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.

C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain **block fillers and primers** for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:

a. Exterior, Flat Acrylic Paint: **1 gal. (3.8 L)** of each color applied.
b. Exterior, Low-Luster Acrylic Finish: **1 gal. (3.8 L)** of each color applied.
c. Exterior, Semigloss Acrylic Enamel: **1 gal. (3.8 L)** of each color applied.
d. Interior, Flat Acrylic Paint: **1 gal. (3.8 L)** of each color applied.
e. Interior, Low-Luster Acrylic Finish: **1 gal. (3.8 L)** of each color applied.
f. Interior, Semigloss Acrylic Enamel: **1 gal. (3.8 L)** of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed below. Benjamin Moore & Co. products are specified, however, comparable products by other manufacturers will be accepted upon submission of comparable product data of that manufacturer.

B. Acceptable Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. Coronado Paint Company (Coronado).
3. ICI Dulux Paint Centers (ICI Dulux Paints).
4. Kelly-Moore Paint Co. (Kelly-Moore).
5. M. A. Bruder & Sons, Inc. (M. A. B. Paint).
6. PPG Industries, Inc. (Pittsburgh Paints).
7. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: **As selected by Architect from manufacturer's full range**.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).

2.4 EXTERIOR PRIMERS

A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.

1. Benjamin Moore; Moore's Acrylic Masonry Sealer No. 066: Applied at a dry film thickness of not less than 0.7 mils (0.018 mm).
2. Benjamin Moore; Moore's Alkyd Masonry Sealer No. 077: Applied at a dry film thickness of not less than 2.7 mils (0.069 mm).

B. Exterior Gypsum or Cement Soffit Board Primer: Factory-formulated alkyd- or alkali-resistant acrylic-latex primer for exterior application.

1. Benjamin Moore; Moorcraft Super Spec Alkyd Exterior Primer No. 176: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).

C. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

D. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

E. Exterior Aluminum Primer under Acrylic Finishes: Factory-formulated acrylic-based metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

F. Exterior Aluminum Primer under Alkyd Finishes: Factory-formulated acrylic-based metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2.5 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).

C. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.

1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

D. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.

1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

E. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

F. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2.6 EXTERIOR FINISH COATS

A. Exterior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for exterior application.

1. Benjamin Moore; Moorcraft Super Spec Flat Latex House Paint No. 171: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).

B. Exterior Low-Luster Acrylic Paint: Factory-formulated low-sheen (eggshell) acrylic-latex paint for exterior application.

1. Benjamin Moore; Moorcraft Super Spec Low Lustre Latex House Paint No. 185: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

C. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.

1. Benjamin Moore; Moorcraft Super Spec Latex House & Trim Paint No. 170: Applied at a dry film thickness of not less than 1.1 mils (0.028 mm).

2.7 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.

1. Benjamin Moore; Moorecraft Super Spec Latex Flat No. 275: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).

B. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.

1. Benjamin Moore; Moorecraft Super Spec Latex Flat No. 275: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).

C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).

D. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).

2.8 INTERIOR WOOD STAINS AND VARNISHES

A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Benwood Paste Wood Filler No. 238.
2. Coronado; none required.
3. ICI Dulux Paints; none required.
4. Kelly-Moore; none required.
5. M. A. B. Paint; Paste Wood Filler.
6. Pittsburgh Paints; none required.
7. Sherwin-Williams; Sher-Wood Fast-Dry Filler.
8. Sherwin-Williams; none recommended.

B. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Benwood Penetrating Stain No. 234.

C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Moore's Interior Wood Finishes Quick-Dry Sanding Sealer No. 413.

D. Interior Alkyd- or Polyurethane-Based Clear Satin Varnish: Factory-formulated alkyd- or polyurethane-based clear varnish.

1. Benjamin Moore; Benwood Interior Wood Finishes Polyurethane Finishes Low Lustre No. 435.

E. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Stays Clear Acrylic Polyurethane No. 423, Satin.

F. Interior Waterborne Clear Gloss Varnish: Factory-formulated clear gloss acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.

1. Benjamin Moore; Benwood Interior Wood Finishes Polyurethane Finishes High Gloss No. 428.

G. Paste Wax: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
    c. If transparent finish is required, backprime with spar varnish.
    d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
    e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky

under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner may engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.

2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Exterior Gypsum or Cement Soffit Board: Provide the following finish systems over exterior gypsum soffit board:

1. Flat Acrylic Finish: **Two finish coats** over an exterior alkyd- or alkali-resistant primer.

   a. Primer: Exterior gypsum soffit board primer.
   b. Finish Coats: Exterior flat acrylic paint.

2. Low-Luster Acrylic Finish: **Two finish coats** over a primer.

   a. Primer: Exterior gypsum soffit board primer.
   b. Finish Coats: Exterior low-luster acrylic paint.

3. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Exterior gypsum soffit board primer.
   b. Finish Coats: Exterior semigloss acrylic enamel.

B. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Low-Luster Acrylic Finish: **Two finish coats** over a rust-inhibitive primer.

   a. Primer: Exterior ferrous-metal primer.
   b. Finish Coat: Exterior low-luster acrylic paint.

2. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a rust-inhibitive primer.

   a. Primer: Exterior ferrous-metal primer.
   b. Finish Coats: Exterior semigloss acrylic enamel.

C. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

1. Low-Luster Finish: **Two finish coats** over a galvanized metal primer.

   a. Primer: Exterior galvanized metal primer.
   b. Finish Coat: Exterior low-luster acrylic paint.

2. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a galvanized metal primer.

   a. Primer: Exterior galvanized metal primer.
   b. Finish Coats: Exterior semigloss acrylic enamel.

D. Aluminum: Provide the following finish systems over exterior aluminum surfaces:

1. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Exterior aluminum primer under acrylic finishes.
   b. Finish Coats: Exterior semigloss acrylic enamel.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Flat Acrylic Finish: **Two finish coats** over a block filler.

   a. Block Filler: Concrete unit masonry block filler.
   b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: **Two finish coats** over a block filler.

   a. Block Filler: Concrete unit masonry block filler.
   b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a block filler.

   a. Block Filler: Concrete unit masonry block filler.
   b. Finish Coats: Interior semigloss acrylic enamel.

4. Semigloss Alkyd-Enamel Finish: **Two finish coats** over a filled surface.

   a. Block Filler: Concrete unit masonry block filler.
   b. Finish Coat: Interior semigloss alkyd enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish: **Two finish coats** over a primer.

   a. Primer: Interior gypsum board primer.
   b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Interior gypsum board primer.
   b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Interior gypsum board primer.
   b. Finish Coats: Interior semigloss acrylic enamel.

4. Semigloss Alkyd-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Interior gypsum board primer.
   b. Finish Coats: Interior semigloss alkyd enamel.

C. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Flat Acrylic Finish: **Two finish coats** over a primer.

   a. Primer: Interior ferrous-metal primer.
   b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: **Two finish coats** over a primer.

   a. Primer: Interior ferrous-metal primer.

b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior semigloss acrylic enamel.

4. Semigloss Alkyd-Enamel Finish: **Two finish coats** over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior semigloss alkyd enamel.

D. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Flat Acrylic Finish: **Two finish coats** over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish: **Two finish coats** over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: **Two finish coats** over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior semigloss acrylic enamel.

4. Semigloss Alkyd-Enamel Finish: **Two finish coats** over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior semigloss alkyd enamel.

3.9 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

1. Alkyd-Based Stain Satin-Varnish Finish: **Two** finish coats of alkyd-based clear satin varnish over a sealer coat and interior wood stain. Wipe wood filler before applying stain.

a. Filler Coat: Open-grain wood filler.
b. Stain Coat: Interior wood stain.
c. Sealer Coat: Clear sanding sealer.
d. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.

2. Waterborne Stain Satin-Varnish Finish: **Two** finish coats of waterborne clear satin varnish over a sealer coat and waterborne interior wood stain. Wipe wood filler before applying stain.

a. Filler Coat: Open-grain wood filler.
b. Stain Coat: Interior wood stain.
c. Sealer Coat: Clear sanding sealer.
d. Finish Coats: Interior waterborne clear satin varnish.

3. Waterborne Stain Full-Gloss Varnish Finish: **Two** finish coats of waterborne clear full-gloss varnish over a sealer coat and interior wood stain. Wipe filler before applying stain.

a. Filler Coat: Open-grain wood filler.
b. Stain Coat: Interior wood stain.
c. Sealer Coat: Clear sanding sealer.
d. Finish Coats: Interior waterborne clear gloss varnish.

4. Alkyd-Based Stain Wax-Polished Finish: **Three** finish coats of paste wax over a sealer coat and alkyd-based interior wood stain.

a. Stain Coat: Interior wood stain.
b. Sealer Coat: Clear sanding sealer.
c. Finish Coats: Paste wax.

B. Natural-Finish Woodwork: Provide the following natural finishes over new interior woodwork:

1. Alkyd-Based Satin-Varnish Finish: **Two** finish coats of alkyd-based clear satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.

a. Filler Coat: Open-grain wood filler.
b. Sealer Coat: Clear sanding sealer.
c. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.

2. Waterborne Satin-Varnish Finish: **Two** finish coats of waterborne clear satin varnish over a sanding sealer. Wipe wood filler before applying stain.

a. Filler Coat: Open-grain wood filler.
b. Sealer Coat: Clear sanding sealer.
c. Finish Coats: Interior waterborne clear satin varnish.

3. Waterborne Full-Gloss Varnish Finish: **Two** finish coats of waterborne clear full-gloss varnish over a sealer coat. Wipe filler before applying stain.

a. Filler Coat: Open-grain wood filler.
b. Sealer Coat: Clear sanding sealer.
c. Finish Coats: Interior waterborne clear gloss varnish.

4. Wax-Polished Finish: **Three** finish coats of paste wax over a sanding-sealer first coat.

a. Sealer Coat: Clear sanding sealer.
b. Finish Coats: Paste wax.

END OF SECTION 09912

SECTION 10155 - TOILET COMPARTMENTS

1.1 SUMMARY

A. This Section includes toilet compartments and screens as follows:
   1. Type: Plastic laminate on medium density core stock, three ply, 37-50 PCF density particle board
   2. Compartment Style: Overhead braced and floor anchored.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for supports that attach units to overhead structural system.
   2. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.2 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

   1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.3 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.4 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Accurate Partitions Corporation.
   2. Ampco Products, Inc.
   3. Bradley
   4. Capitol Partitions, Inc.
   5. General Partitions Mfg. Corp.

1.5 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Plastic laminate: NEMA Standard LD-3.1 – 1991, Grade GP-50

1. Color: One color in each room as selected by Architect from manufacturer's full range of colors.

C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.

D. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:

1. Material: Stainless steel

E. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

F. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

1.6 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.

D. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
2. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.

5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

1.7 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

1.8 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10350

FLAGPOLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Flagpoles: **Provide three (2) flagpoles** as shown on drawings.
2. Flagpole fittings and accessories.
3. Flag.

B. Related Sections:
1. Cast-in-place concrete: Division 3.

1.02 PERFORMANCE REQUIREMENTS

A. Provide flagpole and anchorage system to comply with the following requirements:
1. Flagpole with flag flying: Sustain wind velocity of 70 mph with gusts up to 90 mph without permanent deformation.
2. Safety design factor: 2.5.

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings bearing the stamp of a professional structural engineer registered in the state in which the project is located. Include the following:
1. Configuration of flagpoles and bases.
2. Details showing jointing, anchorage, and support systems.
3. Substantiation of compliance with performance requirements indicated in contract documents.
4. Flagpole finishes, fittings, and accessories.

B. Samples for Verification Purposes: Submit samples for each flagpole type, finish, and color required. Each sample will serve as standard to be expected in the completed work.

C. Manufacturer's Instructions: Submit for each product specified in this section. Include instructions for examination, preparation, and protection of adjacent work.

D. Maintenance Data: Submit for each product specified in this section. Include cleaning and preventive maintenance instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Execute product manufacturer's special instructions to prevent damage to products.

B. Provide suitable protection for each flagpole before shipment. Spiral-wrap pole with heavy kraft paper or polyethylene material and place pole in hard protective tube.

C. Deliver flagpoles and accessories properly labeled and in original wrappings.

D. Store and handle materials in a manner which will prevent damage prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. American Flagpole Division/Kearney-National, Inc., or equal.

2.02 FLAGPOLES AND FLAGS

A. Flagpoles:
1. Mounting: Ground-set, embedded.
2. Type: Conventional.
3. Shaft metal: Aluminum.
4. Shaft form: Cone tapered.
5. Exposed length of flagpole: **40 Feet**
6. Halyard: Internal.

B. FLAG:
1. Flags will be provided by Owner.

2.03 FABRICATION

A. Fabrication - General: Provide each flagpole as a complete unit fabricated by a single manufacturer, including base, anchorage devices, fittings, and accessories as necessary for proper installation.

B. Fabricate and ship flagpole as a single unit, unless shipping constraints preclude this alternative. Where flagpole size dictates shipment in more than one section, provide self-aligning internal sleeve composed of metal compatible with shaft metal and properly designed to allow precise, weathertight joining during installation.

C. Flagpole Diameter and Wall Thickness: Wall thickness of shaft and ratio of top diameter to butt diameter must be appropriate for metal or alloy used and for length of flagpole and flag provided.

D. Joints and Seams: Form joints and seams which are inconspicuous.
1. Exposed welds: Grind exposed welds smooth. Finish to match flagpole shaft.

E. Aluminum Shaft:
1. Seamless extruded tube: Comply with ASTM B 241.
2. Alloy: 6063-T6.

3. Minimum wall thickness: 3/16 inch (minimum) or as required to Accommodate flag.
4. Minimum tensile strength: 30,000 psi.
5. Minimum yield point: 25,000 psi.
6. After flagpole is fabricated, heat-treat and artificially age to alter temper of aluminum.
7. Shaft finish: Color anodized finish.
   a. Color: As selected from manufacturer's standard colors.

F. Ground-Set Flagpole - Embedded Type:
1. Provide flagpole of sufficient overall length to allow setting depth which is not less than 10 percent of exposed length.
2. Flash collar: Fabricate from same metal used for flagpole shaft.
   a. Product: Selected by the architect from manufacturer's standards based on availability for shaft size.
3. Foundation sleeve: Corrugated galvanized steel tube, 16 gage.
4. Foundation sleeve plate: Square steel plate welded to bottom of foundation sleeve.
   a. Minimum edge dimension of square plate: 4 inches larger than inside diameter of foundation sleeve.
   b. Minimum thickness: 3/16 inch.

5. Steel centering wedges: Minimum 1/8-inch-thick wedges, welded to sleeve plate inside foundation sleeve for the purpose of centering pole.
6. Electrical grounding spike: 3/4-inch steel spike, welded to bottom side of sleeve plate.
   a. Length of extension below concrete foundation: Not less than thickness of concrete footing below sleeve plate.
7. Foundation support plate: Square steel plate welded to electrical grounding spike at base of concrete foundation.
   a. Minimum edge dimension of square plate: 6 inches.
   b. Minimum thickness: 3/16 inch.

G. Fittings:
1. Truck:
   a. Truck designed for internal halyard system.
2. Halyards:
   a. Internal type:
      (1) Cable: Stainless steel, with vinyl- or neoprene-covered weight.
      (2) Winch: Direct drive type, internally mounted, with control stop to hold flag in any position on pole.
      (3) Winch crank: Removable.
      (4) Winch access door: Flush-mounted, with cylinder lock.
3. Flag snaps:
   a. Number required: Two flag bronze snaps per halyard.
   b. Material: Bronze, manufacturer's standard.

2.04 CONCRETE MATERIALS

A. Provide materials for concrete flagpole foundations as indicated on drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that conditions conform to requirements of contract documents.

B. Ground-Set Flagpole: Verify that foundation is in suitable condition to receive flagpole.

C. Do not begin flagpole installation until unsuitable conditions have been corrected. Commencement of installation indicates acceptance of conditions.

3.02 PREPARATION

A. Embedded Ground-Set Pole:
   1. Bituminous coating: Apply protective coating of bituminous paint to section of flagpole which will be installed below grade, if not factory-applied by flagpole manufacturer prior to shipment.

3.03 INSTALLATION

A. Concrete Flagpole Foundation: Comply with requirements indicated on drawings.

B. Flagpole Installation - General: Install flagpole, base assembly, and fittings as indicated in contract documents and in accordance with manufacturer's instructions.

C. Install flagpole in erect and plumb position with a tolerance of 1" from 90 degree vertical plane.

D. Embedded Ground-Set Pole: Erect flagpole in foundation sleeve and plumb as necessary using hardwood wedges. Pour dry sand into foundation sleeve in successive layers, each layer 6 inches thick. Tamp each layer before adding next layer. When last sand layer is placed, provide moisture seal over sand by applying sealant of proper thickness. Comply with sealant requirements specified in Division 7.

E. Electrical Grounding: Provide positive lightning ground suitable for flagpole and installation conditions.

F. Field Joints: Provide snug-fitting, weathertight, hairline joints.
   1. Field welding of aluminum flagpole is not acceptable.

G. Tolerances:
   1. Maximum variation from plumb position (90 degrees from horizontal plane): 1 inch.

3.04 ADJUSTING AND CLEANING

A. Clean surfaces.

B. Verify smooth and proper operation of all installed fittings. Adjust as necessary.

END OF SECTIOn

SECTION 10426 – SPECIALTY SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Signage

1.02 SUBMITTAL

A. Manufacturers must submit 3 references showing products for projects completed within the last 6 years.
B. Submit manufacturer's technical data and installation for each type of sign required.
C. Submit shop drawings listing sign size, letterform and letter heights.
D. Submit one full size sample sign of type, style and color specified, including method of attachment. If approved, the sample will become part of the job.

1.03 SIGN TYPE DESCRIPTION

A. Signage shall consist of room number and roomfunction to meet the requirements of the Americans with Disabilities Act – 1990 (ADA) and CABO/ANSI A117.1 – 1992.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Provide products from Mohawk Sign Systems,Inc.® P.O. Box 966, Schenectady, NY, or approved equal.

2.02 GRAPHIC PROCESS

A. All signs shall be manufactured using Graphic Process Series 200A – Sand Carved® using Format D.

1. Tactile characters shall be raised the required 1/32" inches from sign face. Glue-on letters or etched backgrounds are not acceptable.
2. All text shall be accompanied by Grade 2 braille. Braille shall be separated 1/2" from the corresponding raised characters or symbols. Grade 2 braille translation to be provided by signage manufacturer.
3. Perimeter borders shall be 3/8".
4. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.

B. Plaque material shall be melamine plastic laminate, approximately 1/8" thick with contrasting core color. The melamine shall be non-static, fire-retardant and self-extinguishing. The plastic laminate will be impervious to most acids, alkalies, alcohol, solvents, abrasives and boiling water.

C. Letterform shall be [Gill Sans upper case or other san serif or simple serif letterforms].

D. Size of letters and numbers shall be as follows:

1. Room numbers shall be 1".
2. Lettering for room ID signs shall be 3/4".
3. Symbol size shall be 4".
4. Standard Grade 2 braille shall be 1/2" below copy.

E. Copy position: CC centered/centered

F. Graphic Background Color Process:

1. After text / graphics / braille is created by sand carving, the sign background shall be colored with a spray applied finish to produce a contrasting color background, and coated with

satin clear protective finish to withstand abrasion, chemical degradation and UV degradation of underlying color. Color as selected by Architect.

2. After text / graphics / braille is created by sand carving process, the sign background shall be printed with a spray applied coating to produce a full color image on the background surface, and coated with [flat] [satin] clear protective finish to withstand abrasion, chemical degradation and UV degradation of underlying color.

a. Background image shall be provided by Owner or Architect in digital format to make an image with final output resolution of 600 DPI.

2.03 SIGN SIZE AND NUMBER

A. Room function signs, 2" x 8" as required. Provide one sign at each interior door (except restrooms, which are addressed below).
B. Restroom signs shall be design [ADA-4] size [8" x 8"] with a 4" accessibility symbol, gender symbol and the verbal description placed directly below followed by Grade 2 braille. Provide one sign at each restroom.
C. Corners: [1/2" radius] (optional)
D. See typical sign layouts on drawings.

2.04 EXTERIOR WALL SIGNS (Provide one at each exterior doors)

A. Design: [M203-9] [Black] [duranodic aluminum frame] sign, size [9" x 9"].
B. ES Plastic, [color] as selected.
C. Shall have 4" letters with the verbal description, "Entrance"] [using 1" Gill Sans upper case letters directly below] followed by Grade 2 braille.

2.05 MOUNTING

A. Signs shall be mounted using vinyl tape for interior signs and concealed holes and screws for the exterior frame sign. The signs shall be mounted [60" from the floor to the center of the sign on the latch side]. The distance between the door frame and sign should be [2"]. Installer/user assume responsibility for suitable installation of the signs.

10500 Metal / Wood Lockers

General: Lockers shall be **"ART METAL PRODUCTS® Metal / Wood Hybrid KD Wardrobe and Box Lockers**" as manufactured by ART METAL PRODUCTS (AMP) or approved equal. Fabricate lockers square, rigid and without warp, with metal faces flat and free from dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections as standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames except for fastening of number plate.

Finishing: All steel locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. **All steel locker components shall be 708 Midnight Ebony.**

Frame: Fabricate of 16 gauge (minimum) channels, with integral continuous door stop/strike formed on both latch and hinge side vertical members. Cross frame members of 16 gauge channel shapes, including intermediate cross frame members on double and triple tier (frames with doors over 18" high) lockers shall be securely welded to the vertical framing members to ensure rigidity. Rubber bumpers shall be provided to cushion door closing.

Wood Wardrobe Doors: Doors shall be fabricated of furniture grade red oak plywood, covered by red oak veneer, and finished with a 3-coat lacquer finish.

Door Hinges: All doors shall include a 16 gauge continuous piano hinge fastened to the door with screws and riveted to the frame. All doors to be right hand, side hinged..

Body: Fabricate back and sides of 24 gauge (minimum) sheet steel, with double flanged connections extending full height. Form top, bottom and intermediate tier dividers of 24 gauge (minimum) sheet steel with single return bends at all sides. Bolt top and bottom as well as horizontal tier dividers of wardrobe openings to front horizontal frame members at not less than one place in addition to side panels. Form hat shelves at 60” and 72” high single tier lockers of 24 gauge (minimum) sheet steel with single bends at sides and back and a double bend at front.

Locks: Shall be cylinder cam locks and shall be master keyed to one system for the entire project.

Equipment: Furnish each locker with the following items, unless otherwise shown.

Single tier lockers: Openings 60” and 72” shall include one hat shelf, one coat rod and two single prong hooks.

Double tier lockers: Openings 30” and 36” high shall include one coat rod and two single prong hooks.

Triple tier lockers: Openings 20” and 24” high shall include one double prong ceiling hook only.

One-Year Warranty: AMP Metal / Wood Hybrid KD lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section **for a period of one year**.

SECTION 10520 - FIRE-PROTECTION 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:

1. Portable fire extinguishers.
2. Fire-protection cabinets for the following:

   a. Portable fire extinguishers.

3. Mounting brackets for fire extinguishers.

B. Related Sections include the following:
1. Division 9 painting Sections for field painting fire-protection cabinets.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.

C. Maintenance Data: For **fire extinguishers and fire-protection cabinets** to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.6 SEQUENCING

A. Apply **decals or vinyl lettering** on field-painted fire-protection cabinets after painting is complete.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: **Six** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Copper-Alloy Brass Sheet: ASTM B 36/B 36M, alloy UNS No. C26000 (cartridge brass, 70 percent copper).

E. Copper-Alloy Bronze Sheet: ASTM B 36/B 36M, alloy UNS No. C28000 (muntz metal, 60 percent copper).

F. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, **6** mm thick.

G. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class **1 (clear)**.

H. Break Glass: Clear float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.

I. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

J. Wire Glass: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.

K. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, 3 mm thick, double strength.

L. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), **3** mm thick, with Finish **1 (smooth)**.

M. Acrylic Bubble: One piece.

2.3 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Kidde Fyrnetics.
9. Larsen's Manufacturing Company.
10. Modern Metal Products; Div. of Technico.
11. Moon American.
12. Potter Roemer; Div. of Smith Industries, Inc.

13. Watrous; Div. of American Specialties, Inc.

B. General: Provide fire extinguishers of type, size, and capacity for each **fire-protection cabinet and mounting bracket** indicated.

1. Valves: **Manufacturer's standard**.
2. Handles and Levers: **Manufacturer's standard**.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B **and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging**.

C. Multipurpose Dry-Chemical Type in Aluminum Container **3-A:40-B:C, 10-lb (2.3-kg)** nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.4 FIRE-PROTECTION CABINET

A. Manufacturers:

1. Fire End & Croker Corporation.
2. General Accessory Mfg. Co.
3. JL Industries, Inc.
4. Kidde Fyrnetics.
5. Larsen's Manufacturing Company.
6. Modern Metal Products; Div. of Technico.
7. Moon American.
8. Potter Roemer; Div. of Smith Industries, Inc.
9. Watrous; Div. of American Specialties, Inc.

B. Cabinet Type: Suitable for fire **extinguisher**.

C. Cabinet Construction: **Nonrated,** or **1-hour fire rated** to match wall rating where mounted.

D. Cabinet Material: **Enameled-steel** sheet.

1. Shelf: Same metal and finish as cabinet.

E. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
2. Rolled-Edge Trim: **2-1/2-inch (64-mm)** backbend depth.

F. Cabinet Trim Material: **Same material and finish as door**.

G. Door Material: **Steel sheet**.

H. Door Style: **Fully glazed panel with frame**.

I. Door Glazing: **Tempered float glass (clear)**.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide **manufacturer's standard**.
2. Provide **manufacturer's standard hinge** permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
3. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
4. Door Lock: **Cam lock that allows door to be opened during emergency by pulling sharply on door handle**.
5. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

   a. Identify fire extinguisher in fire-protection cabinet with the words "**FIRE EXTINGUISHER**."

      1) Location: Applied to **cabinet door**.
      2) Application Process: **Decals or Pressure-sensitive vinyl letters**.
      3) Lettering Color: **Red**.
      4) Orientation: **Vertical or Horizontal**.

L. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

   a. Exterior of cabinet**, door, and trim**, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet **and door**.

2. Steel: **Baked enamel**.

   a. Color and Texture: **As selected by Architect from manufacturer's full range**.

2.5 MOUNTING BRACKETS

A. Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.

7. JL Industries, Inc.
8. Larsen's Manufacturing Company.
9. Potter Roemer; Div. of Smith Industries, Inc.

B. Mounting Brackets: Manufacturer's standard **galvanized** steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: **Black**.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: **Vertical**.

2.6 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.

a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where **recessed and semirecessed** cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights **indicated below and as acceptable to authorities having jurisdiction.**

1. Fire-Protection Cabinets: **54 inches (1372 mm)** above finished floor to top of cabinet.
2. Mounting Brackets: **54 inches (1372 mm)** above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply **decals** at locations indicated.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

SECTION 10650 - Operable Partitions

PART 1 GENERAL

1.1 RELATED SECTIONS

1.2 REFERENCES

A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2001.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2001.

C. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 1999.

D. ASTM E 413 - Classification for Rating Sound Insulation; 1987 (Reapproved 1999).

E. ASTM E 557 - Standard Practice for The Installation of Operable Partitions; 2000.

F. FS CCC-W-408 - Wall Covering, Vinyl-Coated; Revision D, 1994; cancelled 2001, no superceding document.

1.3 SUBMITTALS

A. Submit 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 instructions.

B. Shop Drawings: Show layout, elevations, supports and anchorage, conditions at jambs and intersections with permanent walls, hardware, joints, and connections.

C. Selection Samples: For each partition finish specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Test Reports: Certified test reports showing compliance with specified performance criteria.

E. Certification: Signed by manufacturer certifying that products installed comply with Contract Documents.

F. Operation and Maintenance Data: Include methods of operating, troubleshooting, and maintaining the specific partitions installed, with recommended methods of cleaning, especially finishes.

1.4 QUALITY ASSURANCE

A. Field Measurements: Verify actual measurements of openings by field measurement prior to fabrication; show measurements on shop drawings.

B. NRC Ratings: Substantiate by tests made in accordance with ASTM C 423.

C. Installer Qualifications: Experienced in performing work of the type specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store products in accordance with manufacturer's recommendations.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.6 WARRANTY

A. Provide manufacturer's standard 1 year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Panelfold, Inc. or approved equal. Basis of design is Panelfold Moduflex 410PP.

- Operation is manual.
- Panels to be Pre-Programmed, side stacking.
- Panel thickness to be 3 ¼”
- Panels to have gypsum board faces machine bonded to heavy duty steel gusseted inner frames and reinforced full height protective formed steel astragals on both vertical and horizontal edges.
- Top and bottom seals are to be automatic
- STC rating is to be a minimum of 47. Panel weight to be 6 lbs/sq. ft.
- Track to be Type 5 Pre-Programmed 7 guage high yield steel track with smooth rolling radial type ball bearing wheels
- Panel to have Sheer Look wrap around panel faces and bronze finish deep nesting universally interlocking panel edges made of steel.
- Panel finish to be Ribtex vertical rib wall carpeting selected from manufacturers 39 available colors.
- Single pass doors are to be located in panels where shown on the Floor Plan. Each door shall be provided with a key lock. Illumination and panic devices are **not** needed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and ASTM E 557.

B. Provide the services of the manufacturer's field representative to advise on proper installation procedures and inspect the finished work.

C. Install and adjust as required to achieve acoustical separation between adjacent areas.

D. Adjust locking hardware for proper operation.

E. Clean up work area and adjacent areas and dispose of debris legally off site.

3.4 DEMONSTRATION

A. Demonstrate operation and instruct Owner's personnel in proper operation and maintenance procedures.

B. Deliver keys and operation and maintenance data to Owner.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10801 - TOILET AND BATH 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. Toilet and bath accessories.

B. Related Sections include the following:

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Samples: For each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

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.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

1. Minimum Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:

1. Toilet and Bath Accessories:

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

C. Mirror Clips – Round, stainless steel “Edge Grip” Provide a minimum of six (6) clips at each wall mounted mirror. Provide model EDG14BS, as manufactured by Mirror Supports.net, or approved equal

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Install accessories in compliance with ANSI A117.1 standards.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet Tissue Dispenser (TTH): Where this designation is indicated, provide toilet tissue holder complying with the following:

1. Products: American Specialties #9030

B. Paper Towel Dispenser and Waste Receptacle(PTD): Where this designation is indicated, provide stainless-steel unit complying with the following:
   1. Products: American Specialties #20469

C. Soap Dispenser (SD): Where this designation is indicated, provide soap dispenser complying with the following:
   1. Products: American Specialties #5001-SS

D. Grab Bar (GB): Where this designation is indicated, provide stainless-steel grab bar complying with the following:
   1. Products: American Specialties 3800 Series

E. Mirrors (MIR): Where this designation is indicated, provide mirror complying with the following: Unframed, ¼" mirror with square edge and supported by Edge Clips (see above). Bottom of mirrors to be mounted at 38" above the floor. Refer to the Floor plans for mirror sizes

F. Baby Changing Station (BCS): Bobrick KB 100-00

G. Sanitary napkin disposal (SN)– Bobrick B-5270 Matrix

END OF SECTION 10801

SECTION 14240

HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
   1. Standard pre-engineered hydraulic passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Jack(s).
   4. Operation and control systems.
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   2. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   3. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   4. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   5. Division 22 Plumbing:
      a. Sump pit and oil interceptor.
   6. Division 23: Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and machine rooms.
   7. Division 16 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches.
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in machine room, hoistway and pit.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for hydraulic elevators. State or local requirements must be used if more stringent.

   1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
   2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
   3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
   4. Elevator hoistways shall have barricades, as required.
   5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
   6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
   7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
   8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of

non-combustible material extending 42'' minimum, (48'' minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.

9. Machine room to be enclosed and protected.
10. Machine Room temperature must be maintained between 55º and 90º F.
11. If machine room is remote from the elevator hoistway, clear access must be available above the ceiling or metal/concrete raceways in floor for oil line and wiring duct from machine room.
12. Access to the machinery space and machine room must be in accordance with the governing authority or code.
13. Provide an 8” x 16” cutout through machine room wall, for oil line and wiring duct, coordinated with elevator contractor at the building site.
14. All wire and conduit should run remote from either the hoistways or the machine room.
15. When heat, smoke or combustion sensing devices are required, connect to elevator machine room terminals. Contacts on the sensors should be sided for 120 volt D.C.
16. Install and furnish finished flooring in elevator cab.
17. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
18. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
19. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
20. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
21. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
22. General Contractor shall fill and grout around entrances, as required.
23. Elevator sill supports shall be provided at each opening.
24. All walls and sill supports must be plumb where openings occur.
25. For applications with jack hole, free and clear access to the elevator pit area for the jack hole-drilling rig is required.
26. Where jack hole is required, remove all spoils from jack hole drilling.
27. When not provided by Elevator Contractor, jack hole shall accommodate the jack unit. If required the jack hole is to be provided in strict accordance with the elevator contractor's shop drawings.
28. Locate a light fixture and convenience outlet in pit with switch located adjacent to the access door.
29. A light switch and fused disconnect switch for each elevator should be located inside the machine room adjacent to the door, where practical, per the National Electrical Code (NFPA No. 70).
30. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway (or in the machine room).
31. For signal systems and power operated door: provide ground and branch wiring circuits, including main line switch. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.
32. Wall thickness may increase when fixtures are mounted in drywall. These requirements must be coordinated between the general contractor and the elevator contractor.
33. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc..
34. Locate telephone and convenience outlet on control panel.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor will provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
   1. Show equipment arrangement in the machine room/control space, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat Paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
   1. Owners Manual and Wiring Diagrams.
   2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in manufacturing, installing, and servicing elevators of the type required for the project.
   1. Must be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
      a. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
   2. The manufacturer shall have a documented, on-going quality assurance program.
   3. ISO-9001:2000 Manufacturer Certified
   4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
   1. ASME/ANSI A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
   2. Building Code: National.
   3. NFPA 70 National Electrical Code.
   4. NFPA 80 Fire Doors and Windows.
   5. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
   6. CAN/CSA C22.1 Canadian Electrical Code.
   7. CAN/CSA B44 Safety Code for Elevators and Escalators.

D. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally

Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
   1. Arrange for inspections and make required tests.
   2. Deliver to the Owner upon completion and acceptance of elevator work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing will deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

B. Provide the hole for the jack unit (if required by the type of jack provided), based on excavation through normal soil or clay which can be removed by manual digging or by standard truck-mounted regular drilling unit. Provide a casing if required to retain the walls of the hole. General contractor shall remove excavation spoils deposited in the elevator pit.
   1. If a physical obstruction or hindrance is encountered below the ground surface, including boulders, rock, gravel, wood, metal, pilings, sand, water, quick sand, caves, public utilities or any other foreign material, obtain written authorization to proceed with excavating using special excavation equipment.
   2. Maintain a daily log of time and material costs involved.
   3. Elevator contractor will be compensated on a time and material basis for additional costs incurred after encountering the physical obstruction or hindrance, including the cost of the special excavation equipment.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator from date of Substantial Completion during normal working hours, excluding callbacks. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.

   1. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: ThyssenKrupp Elevator

2.02 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's standard colors, patterns, and finish charts.

B. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied baked enamel.

C. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.

D. Carpet: By others.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 3-stage. Two jacks piped together, mounted one on each side of the car with each having three telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. A follower guide shall be furnished for the top of the lower two plungers and be guided by rollers running inside a steel guide channel which is firmly attached to the guide rail system. This plunger guide system shall maintain a stabilized support for the plunger sections. Each Jack Assembly shall have check valves built into the assembly to allow for automatically re-syncing the three plunger sections by moving the jack to its fully contracted position.

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade readily biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

2.04 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
   1. Oil reservoir with tank cover.
   2. An oil hydraulic pump.
   3. An electric motor.
   4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.

D. Control System: Shall be microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.

E. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.

F. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.

G. Oil Type: USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas.
USDA certified biobased product, >90% bio-based content, per ASTM D6866

2.05 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
   2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish.
   3. Typical door & frame finish: ASTM A 366 steel panels,factory applied powder coat enamel finish.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
      a. Reveals and frieze: Powder Coated
   2. Canopy: Cold-rolled steel with hinged exit.
   3. Ceiling: Downlight type, metal pans with suspended LED downlights.
   4. Cab Fronts, Return,Transom, Soffit and Strike: Provide panels faced with brushed stainless steel.
   5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
      a. Door Finish: ASTM A1008 steel panels, factory applied powder coat enamel finish.
      b. Cab Sills: Extruded aluminum, mill finish.
   6. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
   7. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.

B. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.

   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no

coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.

3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Devices: Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel: Not Required

D. Column Mounted Car Riding Lantern: Not required for this application.

E. Special Equipment: Not Applicable

2.09 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
C. Special Operation: Not Applicable
D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.

2.10 HALL STATIONS

A. Hall Stations, General: Provide buttons with red-illuminating LED halos to indicate that a call has been registered at that floor for the indicated direction. Provide 1 set of pushbutton risers. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
   1. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at all typical landings.

D. Hall lanterns: A hall lantern with adjustable chime shall be provided at each landing and located adjacent to the entrance. The lanterns, when illuminated, shall indicate the elevator car that shall stop at the landing and in what direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall lantern shall illuminate and the chime shall sound. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor. Illumination of the arrow shall be with LED's. Faceplates shall match the hall station finish. Provide at all typical landings.

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Jack unit excavation (if required by the type of jack provided): Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
   1. Install casing for jack unit.
   2. Provide HDPE jack protection system for all in ground jacks.
   3. Set casing for jack unit assembly plumb, and partially fill with water-settled sand, eliminating voids. Back fill depth shall be sufficient to hold the bottom of the jack in place over time.

C. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

D. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

E. Lubricate operating parts of system where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

A. Elevator Qty. 1
   1. Elevator Model: endura Above-Ground (3-Stage)
   2. Rated Capacity: 4500 lbs.
   3. Rated Speed: 125 ft./min.
   4. Operation System: TAC32
   5. Travel: 35'-0"
   6. Landings: 4 total
   7. Openings:
      a. Front: 3
      b. Rear: 1
   8. Clear Car Inside: 5' - 8" wide x 7' - 10" deep
   9. Cab Height: 8'-0" nominal
   10. Hoistway Entrance Size: 4'-0" wide x 7'-0" high
   11. Door Type: TWo Speed
   12. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
   13. Seismic Requirements: Zone 1
   14. Fixture & Button Style: fixturestyle
   15. Special Operations: None

3.09 SPECIAL CONDITIONS (Note: Add Special Conditions as Needed)

END OF SECTION

DIVISION 15 - MECHANICAL

15 010	GENERAL REQUIREMENTS
15 060	PIPES & PIPE FITTINGS
15 100	VALVES
15 120	PIPING SPECIALTIES
15 140	PIPING SUPPORTS & ANCHORS
15 190	MECHANICAL IDENTIFICATION
15 240	NOISE & VIBRATION CONTROL
15 250	INSULATION
15 330	FIRE PROTECTION SYSTEM
15 410	PLUMBING PIPING SYSTEMS
15 440	PLUMBING FIXTURES, SPECIALTIES & EQUIPMENT
15 510	HYDRONIC PIPING SYSTEMS
15 530	REFRIGERANT PIPING SYSTEMS
15 557	BOILERS
15 774	SPLIT SYSTEM HEAT PUMPS
15 780	COMPUTER ROOM AC UNITS
15 785	ROOFTOP AC UNITS
15 860	FANS AND ERV'S
15 890	DUCTWORK
15 910	DUCTWORK ACCESSORIES
15 940	AIR OUTLETS & INLETS
15 950	CONTROLS

END OF TABLE OF CONTENTS

SECTION 15 010

GENERAL REQUIREMENTS

1. GENERAL

1.1 Work Included:
- A. Plumbing systems.
- B. Fire Protection systems
- C. Heating, ventilating, and air conditioning systems.

1.2 Related Work:
- A. Requirements of: "General Conditions for the Contract" and "Division 1".
- B. Requirements of other sections or divisions as relates to: products installed but not furnished; or, products furnished but not installed under a this division.
- C. Requirements of other sections or divisions as relates to: coordination of work.

1.3 Codes and Standards:
- A. Comply with the current edition of the following codes, in force by law, including all amendments and referenced codes and regulations: the Virginia Uniform Statewide Building Code; the National Fire Codes; local building ordinances; and the rules and regulations of the building Owner for work on site.
- B. Exceed minimum recommendations of: NSF, ASPE, ASHRAE, and SMACNA.

1.4 Shop Drawings and Product Data:
- A. Submit shop drawings and/or product data on all manufactured equipment and materials specified or referenced in this Division and on the associated drawings.
- B. Submit shop drawings and product data electronically in PDF format in accordance with requirements in Division 1 and as required herein.
- C. Shop drawings and product data shall include:
  1. Clear identification of manufacturer and all submitted items.
  2. Manufacturer's catalog literature
  3. Manufacturer's installation instructions
  4. Specific performance characteristics
  5. Specific dimensional data
  6. Specific electrical characteristics
- D. Refer to individual specification sections for additional requirements on specific items.

1.5 Operating and Maintenance Data:
- A. Upon substantial completion of the contract, provide the owner with a complete set of manufacturer’s operating, maintenance, and preventive maintenance instructions, parts, lists and complete procurement information, including equipment numbers and descriptions for all equipment installed on the project. Required information shall include energy ratings as needed for future conservation calculations.
- B. Submit in accordance with requirements in Division 1 and as required herein.
- C. Provide at time of substantial completion and prior to final inspection.
- D. Manual shall be in a three ring binder, tabbed by specification section.
- E. Operating and maintenance data for each section shall include:
  1. Summary list of equipment and materials used on project.
     - a. Indicate name, model number, serial number, and name plate data for each.
     - b. Manufacturer's complete catalog information for each.
     - c. Manufacturer’s complete installation instructions for each.
  2. List of mechanical equipment requiring lubrication.
     - a. Indicate name of equipment, location, and type and frequency of lubrication.
  3. Manufacturer's maintenance instructions for each piece of equipment.
     - a. Include name of vendor, installation instructions, parts numbers and lists, operation instructions, and maintenance and lubrication instructions.
  4. Warranty certificates for each item clearly indicating expiration date (including any specified extended warranties) on each certificate.

F. Refer to individual specification sections for additional requirements on specific items.
G. Operating staff persons shall be provided with written instructions for the proper operations of systems and equipment.

1.6 Warranties:
A. Refer to Division 1 for general project guaranties.
B. Guarantee mechanical systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents. This includes offsets in the ductwork as noted on the plans.
C. The beginning of the specified time frame for warranties for equipment and materials specified under this Division, shall coincide with the beginning of the general warranty for the project specified in Division 1.
D. Refer to other Sections for requirements for specific equipment.

2. PRODUCTS

2.1 Materials and Equipment:
A. Provide new materials and equipment unless otherwise noted.
B. Adhesives, sealants, paint, and sealant primers shall comply with the requirements for Low Emitting materials for new construction. Provide shop drawings of all such materials used on the project clearly indicating their VOC limits.
C. Furnish (including freight and unloading) and install unless otherwise noted.
D. Store materials and equipment on site and protect from weather.
E. Access panels shall be:
1. suitable for the wall or ceiling type installed in
2. 14 gauge cold rolled steel, galvanized and bonderized
3. with metal frame, butt hinges and screw operated cam type latch
4. finish selected by the Architect
5. Cesco Model W or approved equal

2.2 Substitutions:
A. Equipment and materials used on project shall be those specified as basis of design.
B. Acceptable alternate manufacturer's are listed.
1. Equivalent products by these manufacturer's may be substituted.
2. Contractor is responsible for guaranteeing `equivalence'.
C. Contractor must make a written request to the Architect, for approval to substitute materials or equipment by manufacturers not listed, at least five working days prior to bidding date.

3. EXECUTION

3.1 Drawings:
A. Mechanical drawings indicate general arrangement of pipe, equipment, ducts, etc.
1. Follow as closely as possible in actual building construction.
2. Coordinate with other trades.
3. Modify sizes of ductwork and provide offsets in piping and ductwork, as required due to interference with the building structure or other trades, at no additional cost to the Owner. Maintain equivalent free area duct dimensions.
B. Consider the Civil, Architectural, Structural, Plumbing, and Electrical drawings part of this work insofar as these drawings furnish information relating to design and construction of this building.
C. Due to the small scale of the drawings, all offsets, fittings and accessories required are not shown.
1. Provide offsets, fittings, and accessories not shown but required to complete installation at no additional cost to the Owner.
D. In case of conflict between Specifications and Mechanical drawings, contact the Architect for direction as to which to follow before proceeding.
1. Notify Architect of any change in Contract Cost required to complete work each way.
2. Contractor is responsible for costs resulting from proceeding without direction or clarification from Architect.

3.2 Coordination:

A. Coordinate installation of work under this Division with work installed under other Divisions.
B. Notify Architect immediately of conflicts or deficiencies.
C. Do not proceed until unsatisfactory conditions have been resolved.
D. Coordinate with Architect before disconnecting utilities to equipment to remain in use.
E. Provide access panels to allow service access to equipment, dampers and terminal boxes located above inaccessible ceilings. Install panels to allow proper service access to devices.

3.3 Project Closeout:

A. Motor and equipment nameplates and applicable UL and AGA labels shall be in place when Project is turned over to the Owner.
B. Repair damaged and defective equipment and materials.
   1. Replace items that cannot be properly repaired.
C. Clean exposed and semi-exposed surfaces of equipment and materials.
   1. Touch-up shop-applied finishes to restore damaged or soiled areas.

3.4 Training:

A. Instruct Owner's representative in operation and maintenance of mechanical systems utilizing Operation and Maintenance Manual.
B. Minimum instruction period shall be:
   1. HVAC Equipment - four hours.
   2. Controls - four hours.
   3. Plumbing systems - two hours.
C. Instruction period shall occur after substantial completion of Mechanical systems and prior to completion of project.
D. Coordinate with the Architect and Owner.

END OF SECTION 15010

SECTION 15 060 - PIPES & PIPE FITTINGS

1. GENERAL

1.1 Work included:
- A. Piping materials
- B. Pipe fittings
- C. General piping installation procedures

2. PRODUCTS

2.1 Piping:
- A. Refer to other sections of this Division for types of piping to be used for various piping systems.
- B. Piping materials shall conform to the standards listed in the International Plumbing Code.

2.2 Fittings:
- A. Same type and class of material as pipe, or of material having equal or superior physical and chemical properties.
- B. Thread lubricant shall be teflon tape or pipe dope complying with 15010, 2.1 B.
- C. Cement for solvent weld shall be type recommended by pipe manufacturer and comply with 15010, 2.1 B.

2.3 Unions:
- A. Rated to 250 psi at 180°F, bronze.
- B. Watts No. 3200 or equal.

3. EXECUTION

3.1 General:
- A. Fabricate and install piping systems in accordance with requirements in other sections and with materials suitable for the intended fluid and operating temperatures.

3.2 Piping sleeves:
- A. Provide sleeves for piping penetrating walls and floors as follows:
  1. Use cast iron sleeves for piping passing thru footings and foundation walls.
  2. Use 14 ga. galvanized steel sleeves for piping passing through walls and floors above grade.
  3. Extend sleeves to 2 inches above floors subject to wetting.
  4. Run insulation continuous thru sleeves.
  5. Grout in solid around sleeves.
  6. Firestop between piping and sleeve passing through fire rated walls, ceilings and floors with UL Listed firestop material or equipment - refer to diagrams on the drawings.

3.3 Cutting and patching:

A. Keep to a minimum.
B. When required, do cutting as required by trades-person responsible for construction of wall or floor being cut.
C. Patching and finish repairs are to be done by trade responsible for wall or floor surface being patched.

3.4 Piping installation:

A. Run vertical risers square and plumb.
B. Make connections of dissimilar metals with insulating couplings.
C. When metallic piping is in contact with a material or atmosphere exerting a corrosive action, piping and fittings shall be coated with a corrosion-resistant material.
D. Welding shall be done by experienced, certified welders.
E. Support piping run on ground on minimum 18 inch tall steel pipe columns with welded steel rack and pipe clamps, secured to the ground. Supports to be of weatherproof finish. Kindorf pipe racks will be acceptable.
    1. Spacing shall be as specified in hanger spacing schedule.
F. Provide chrome plated escutcheon for exposed piping penetrating a finished surface.
    1. Secure escutcheon to finished surface with silicone caulking.
G. Do not run plastic pipe in ceiling plenums, unless pipe is Listed for special use in plenums.
H. Special requirements are necessary for running piping underground/underslab - refer to the specific piping section for requirements.

3.5 Project closeout:

A. Remove mud, dust, dirt and flux from piping.
B. Flush and chemically clean piping systems as specified in specific section pertaining to that system.
C. Pressure test piping systems in accordance with requirements in individual sections.
    1. Notify Architect 72 hours prior to conducting tests.
    2. Remove pressure sensitive devices prior to conducting tests.

END OF SECTION 15060

SECTION 15 100 - VALVES

1. GENERAL

1.1 Work included:
- A. Equipment shutoff
- B. Pressure regulating
- C. Balancing
- D. Control
- E. Safety Relief

2. PRODUCTS

2.1 Acceptable Manufacturer's:
- A. Amtrol, ASCO, Armstrong, Bell & Gossett, Conbraco, Crane, Danfoss, Durabla, Essex, Flo Pac, Grinnell, Honeywell, McDonald, Nibco, Paco, Red-White, Taco, Victaulic, Watts.
- B. Valves of the same type provided for the project shall be by a single manufacturer.

2.2 Equipment Shutoff:
- A. Gate valves:
  1. 150 lb. swp., block pattern, union bonnet, solid wedge.
  2. Bronze on potable water and iron on other.
  3. Nibco No.*-134 or equal.
- B. Ball valves:
  1. 150 lb., full port, bronze, blowout proof stem, teflon seat.
  2. Nibco No. *-585-70 or equal.
- C. Check valves:
  1. Inline lift type, teflon seat, spring actuated, bronze body, 125 psi, 150°F.
  2. Suitable for horizontal or vertical installation.
  3. Nibco T-480Y or equal.
- D. Gas cock: bronze, tee head pattern, 15 psi max. gas pressure. McDonald No. 10552 or equal.

2.3 Balancing and Service:
- A. Manual balancing valves:
  1. Ball type valve with valved gauge fittings; adjustment knob; calibrated nameplate; memory stop; bronze, pre-insulated body; instructions and calculation charts.
  2. Bell & Gossett Type CB or equal.
- B. Hose end drain valve:
  1. 3/4", copper to hose type.
  2. Nibco No. 72 or equal.

2.4 Pressure regulating valves:
- A. Water service:
  1. Union inlet connections, integral stainless steel strainer, rated to 300 psi, reduced pressure range of 25 to 85 lbs., with built-in thermal bypass and bronze body.
  2. Watts U5B or equal.
- B. Hydronic heating make-up:
  1. Extra large diaphragm, spring case construction, 12 lb. setting, 160 F max. temp., 150 psi.
  2. Watts N256 or equal.
- C. Gas pressure regulating valve:
  1. Rated for 15 psi maximum gas pressure, 2 psi operating pressure, straight thru flow, non-lockup type, high pressure cast aluminum housing, vent connection.
  2. Provide vent limiting device in accordance with local gas utility recommendations, or vent regulator to exterior as er manufacturer's recommendations.
  3. Maxitrol RV series or equal.

2.5 Control valves:

A. 2-way electric zone valves:
   1. Synchronous motor and gear assembly mounted on valve; brass valve body; stainless steel shaft; manual opener; auxiliary end switch; rated 125 psi; rotating rubber ball seal.
   2. Honeywell Model Series V8043 or equal.

B. 3-way electric zone valves:
   1. Synchronous motor and gear assembly mounted on valve; brass valve body; stainless steel shaft; manual opener; auxiliary end switch; rated 125 psi; rotating rubber ball seal.
   2. Honeywell Model Series V8044 or equal.

2.6 Safety relief:

A. ASME P&T relief valve:
   1. Fully automatic, bronze body, 200 MBH rating.
   2. Watts 40 XL or equal.

B. Vacuum relief valve:
   1. Watts No. 36 or equal.

2. EXECUTION

2.1 Preparation:

A. Provide valves in piping systems as follows:
   1. Equipment shut-off: gate or ball.
   2. Pressure regulating: at water service, set to pressure designated by Owner's representative.
   3. Water service: gate or ball valve, backflow preventer, pressure gauge and pressure regulating valve as per local code requirements.
   4. Gas shut-off: gas cock.
   5. Pump discharge: check.
   6. Heating water manifolds: electric zone valve, balancing valve.
   7. Hot water recirculating: balance valve.

2.2 Installation:

A. Install valves as follows:
   1. With stems upright and with clearance for handle.
   2. Dismantle if required to prevent overheating seals and packing during installation.

B. Provide valve tags with identification.

2.3 Project Closeout:

A. Clean bodies with liquid detergent.

END OF SECTION 15100

SECTION 15 120 - PIPING SPECIALTIES

1. GENERAL

1.1 Work included:
- A. Back-flow prevention devices
- B. Temperature gauges
- C. Pressure gauges
- D. Air Vents
- E. Strainers

2. PRODUCTS

2.1 Vacuum breaker:
- A. Watts 288A or equal by Amtrol or Taco.

2.2 Backflow preventers:
- A. Water service:
  1. Reduced pressure type, UL and ASSE 1013 approved, bronze with strainer.
  2. Watts No. 909S or equal by Appollo, Hersey or Febco.
- B. Cold water make-up to boiler:
  1. Continuous press. type w/ intermediate atmospheric vent, brass body, double check, union connections.
  2. Watts No. 9D or equal by Appollo, Hersey, or Sparco.

2.3 Fixed air gap:
- A. Watts 909-AG.

2.4 Temperature gauges:
- A. Red reading type, glass fronts, 9 inch scales, cast aluminum case, adjustable angle with socket.
- B. Trerice No. A005 or equal by Ametek or Weiss.

2.5 Pressure gauges:
- A. 4.5 inch diameter case, bronze tubes, bronze movements, white dial, black micrometer, adjustable pointers, and 0-100 psi range.
- B. Provide cock and equalizing tube.
- C. Trerice No. 610C or equal by Ametek or Weiss.

2.6 Automatic air vent:
- A. 240 degrees F, non-metallic float, stamped brass body.
  1. Branch lines - rated to 30 psi., Hoffman No. 790.
  2. Main lines - rated to 75 psi, Hoffman No. 79.
- B. Alternate manufacturers are Amtrol, Armstrong or Taco.

2.7 Manual air vent:
- A. Rated to 50 psi., 240 degrees F, disc-type vent, built-in check valve, 1/8" straight shank connection.
- B. Hoffman No. 500 or equal by Amtrol, Armstrong or B&G.

2.8 Strainer:
- A. Rated to 400 psi, 210 F, bronze body, screwed ends, closure plug, 20 mesh stainless steel screen.
- B. Watts 777 or equal by Nibco or Stockholm.

2.9 Air separator:
- A. Inline type, steel tank, stainless steel strainer, 150 psi working pressure, 375 F max. pressure, 330 gpm max. flow.
- B. Taco Model AC4F or equal by Amtrol or Wood.

2.10 Purger with air vent:
- A. Inline type, cast-iron body.
- B. Amtrol Mdl. 447 with #706 air vent, or equal by Taco or Wood.

2.11 Chemical pot feeder:
- A. Manual type, 1½ gal., galv. steel tank, 2" fill and 1/2" NPT drain/test port connection, isolation valves, rated to 45 psi.
- B. Provide chemicals to eliminate oxygen, reduce scale, neutralize hardness and raise PH to 9-10.
- C. National Chemsearch Co. or equal by Mogul, Betz Entec or Anderson.

3. EXECUTION

3.1 Vacuum breakers:
- A. Provide at wall hydrants and hose bibbs.

3.2 Backflow preventers:
- A. Install horizontally at points in piping indicated on the drawings.
- B. Extend drain piping from vent thru fixed air-gap to drain as indicated on the drawings.
- C. Clean strainer after 30 days of operation.

3.3 Temperature gauges:
- A. Provide in hydronic heating system at locations indicated.
- B. Provide in hot water recirculate piping at water heater.
- C. Provide immersion well for sensor probes.

3.4 Pressure gauges:
- A. Provide at regulating valve of supply side of water service.
- B. Provide in hydronic heating system at locations indicated.
- C. Provide needle valve shut off for pressure gauge.

3.5 Auto air vents:
- A. Provide at high points in heating water supply and return piping, and at piping manifolds.
- B. Provide 8" nipple at vent location on main piping and install vent.
- C. Provide 1/8" copper or nylon tubing off vent discharge connection and extend to gravel subbase under slab or floor drain.

3.6 Strainers:
- A. Provide at locations indicated on the drawings.
- B. Locate strainers so cleanout plug is accessible.
- C. Clean strainers after 24 hours and 30 days of operation.

3.7 Air separator:
- A. Install in piping system at location indicated.
- B. Clean strainer in air separator after 30 days of operation.

3.8 Chemical pot feeder:
- A. Provide in piping system at location indicated. Install to allow service access.

END OF SECTION 15120

SECTION 15 140 - PIPE SUPPORTS & ANCHORS

1. GENERAL

1.1 Work included:
- A. Hangers and Clamps

2. PRODUCTS

2.1 Acceptable Manufacturers:
- A. B-Line, Fee & Mason, Grinnell, Mason Industries, or Michigan.

2.2 Pipe hangers:
- A. Standard clevis hanger, steel, plain finish. B-Line Figure B3100.

2.3 Pipe clamps:
- A. Short pipe strap, steel, plain finish. B-Line Figure B3180.

2.4 Hangers and clamps for uninsulated copper pipe shall be copper plated or plastic covered.

3. EXECUTION

3.1 Preparation:
- A. Metal piping - support rod sizes for hangers and maximum spacing for hangers and clamps:
  1. Pipes up to 1" - 3/8" rods, 6 feet on center.
  2. Pipes 1.25 to 2" - 3/8" rods, 8 feet on center.
  3. Pipes 2.5 to 3.5" - 1/2" rods, 10 feet on center.
  4. Pipes 4 to 5" - 5/8" rods, 10 feet on center.
  5. Pipes 6" - 3/4" rods, 10 feet on center.
- B. Plastic piping:
  1. Support rod sizes for hangers - same as for metal piping.
  2. Maximum spacing for hangers and clamps - 4 feet on center.
- C. Support vertical runs of piping with clamps at maximum six foot intervals.
- D. Size hangers and clamps for insulated pipe to surround insulation.
- E. Size riser clamps to pipe size.

3.2 Installation:
- A. Secure clamps to structure.
- B. Make adequate provisions for expansion, contraction, slope, and anchorage.
- C. Do not lay or support piping on any building member.
- D. Provide galvanized steel insulation shields at hangers and clamps for insulated pipe.
- E. Support vertical runs with hangers at top of risers.

3.3 Project Closeout:
- A. Make sure hangers are supporting pipe and not loose.

END OF SECTION 15140

SECTION 15 190 - MECHANICAL IDENTIFICATION

1. GENERAL

1.1 Work included:
- A. Piping painting and labels
- B. Valve tags
- C. Equipment tags

2. PRODUCTS

2.1 Piping labels:
- A. Factory made, self adhering markers, pressure sensitive style, vinyl.
- B. Except as otherwise specified, colors shall conform with ANSI and OSHA Standards.
- C. Pipe marker legends and background colors shall conform with Owner's existing standards.
- D. Legend sizes for bare or insulated pipe shall be as follows:
  1. for pipes smaller than 1" - 5/16" high
  2. for pipes 1" to 3" - 1" high
  3. for pipes 3" and larger - 2" high
- E. Seton Name Plate Corp., Opti-Code Inc or W.H. Brady Co.

2.2 Valve tags:
- A. 1.5" round, 19 gauge brass tags.
- B. 1/4" legend text over 1/2" number, black filled.
- C. No. 16 brass jack chain and S-hook.
- D. Seton Name Plate Corp., Opti-Code Inc or W.H. Brady Co.

2.3 Equipment tags:
- A. Engraved plates: black formica with white reveal on engraving.
- B. Minimum text height - 1/8".
- C. Seton Name Plate Corp., Opti-Code Inc or W.H. Brady Co.

2.4 Duct labels:
- A. Factory made, self adhering markers, pressure sensitive style, vinyl.
- B. Except as otherwise specified, colors shall conform with ANSI and OSHA Standards.
- C. Legend sizes - 1/2".
- D. Seton Name Plate Corp., Opti-Code Inc or W.H. Brady Co.

3. EXECUTION

3.1 Piping systems:
- A. Label new piping as indicated herein.
- B. Identify piping and gages with color codes and permanent labels.
  1. Provide labels at major branches, wall penetrations, in mechanical rooms, at changes in direction and at 20 foot intervals.
  2. Provide direction of flow arrow at each label.
- C. Color code piping systems as follows:
  1. Domestic cold water - Blue stripe
  2. Domestic hot water - Orange stripe
  3. Domestic hot water recirculate - Orange solid
  4. Refrigerant piping - Green stripe
  5. Condensate drain - Yellow stripe
  6. Heating water supply - Red solid
  7. Heating water return - Red stripe

3.2 Valve tags:
- A. Provide engraved brass or laminated valve tag with valve number and valve service for each valve.
- B. Provide valve chart in frame identifying valves by number location and use.

C. Frame and hang chart in Mechanical Room at completion of project.

3.3 Equipment tags:

A. Provide tags at each piece of major equipment.
B. Install on equipment at readily visible location.
C. Secure to unit with stainless, sheet metal screws.
D. Tag shall indicate: equipment mark (ie: ERV, RTU, OU-1, FC-1, AH-2, etc.) and warranty expiration date for each.

3.4 Duct labels:

A. Provide label at each duct access door.
B. Label shall indicate device being accessed.

END OF SECTION 15190

SECTION 15 240 - NOISE & VIBRATION CONTROL

1. GENERAL

1.1 Work included:
- A. Noise Control:
  1. offsets in branch ductwork.
  2. Acoustical duct lining
- B. Vibration Control:
  1. flexible duct connectors
  2. Spring type vibration isolators
  3. flexible pump connectors
  4. flexible refrigerant pipe connectors

2. PRODUCTS

2.1 Offsets in Branch Ductwork:
- A. Provide offsets and elbows in branch ductwork as shown to minimize noise transfer.
- B. When branch duct connections are taken off the main trunk ducts, provide offsets at the connections as shown on the plan.

2.2 Duct liner:
- A. Material - long glass fibers bound with thermosetting resin with black airstream coating.
- B. Density - 2 lb.; Absolute roughness factor - 0.004.
- C. Adhesive - ASC-A-7001A-1971 approved.
- D. Mechanical fasteners - SMACNA MF-1-1971.
- E. Design based on Certainteed Ultralite Type 200.
  1. Equal by Johns-Manville, Knauf, or Owens-Corning will be accepted

2.3 Flexible duct connectors:
- A. 3" wide, fiberglass reinforced, neoprene band, bound to galvanized sheet metal flange.
- B. Duro-Dyne, Ventglas.

2.4 Vibration Isolators:
- A. As specified or equal by Amber/Booth, B-Line, California Dynamics Corp., Mason, or Sausse & Co. Inc. MW.
- B. TYPE D - hanger type, spring type isolator.
  1. Laterally stable with housing.
  2. Spring shall be sized based on weight of equipment, min. 1/2" deflection, 30 degree rod swing angle.
  3. Design based on Mason Type 30N.
- C. TYPE A - ribbed neoprene pad.
  1. Overall thickness 3/4", rated 50 psi.
  2. Pads used outdoors shall be weatherproof construction.
  3. B-Line Part No. NNP-*.
- D. TYPE B - free standing, spring type isolator.
  1. Laterally stable without housing.
  2. Baseplate to have 1/4" neoprene, acoustical, friction pad on underside and bolt holes for securing baseplate to the supporting structure.
  3. Design based on Mason Type SLFH.
- E. TYPE C - housed, spring type isolator.
  1. Similar to Type B, but complete with housing that includes vertical limit stops.
  2. Mountings used out of doors shall be hot dipped galvanized.
  3. Design based on Mason Type SLR.
- F. TYPE E - rooftop curb bases to fit over the roof curb and under the isolated equipment. The extruded aluminum top member shall overlap the bottom member to provide water runoff independent of the seal. Wind resistance shall be provided by means of resilient snubbers in

the corners with a minimum clearance of 1/4". The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible ductlike neoprene connection joining the outside perimeter of the aluminum members. Design based on Mason Type CMAB.

2.5 Flexible pump connectors: Nylon reinforced neoprene, twin, sphere connectors. Coupling - Threaded or flanged; Working pressure - 150 PSIG at 220 F. Design based on Mason Type MFTNC or MFTFU or equal by General Rubber Corporation or MetraFlex. Provide control wire or cables at close-coupled pump connections.

2.6 Flexible refrigerant piping connectors:
- A. Core - Bronze, close pitch annular; Hose braid - Braided bronze; Ends - Copper sweat; Working pressure - 300 PSIG.
- B. Mason Industries Type BBF or equal by MetraFlex or Universal.

2.7 Sound attenuators (duct): Length - 5 ft.; Free area - 50 percent; Outer shell - Galvanized steel; Inner liner - Perforated galv. steel; Fill material - Fiberglass; Attenuation - see equipment list on drawings. Semco, Beuensod, Anemostat, United.

3. EXECUTION

3.1 Offsets in Branch Ductwork:
- A. Install as shown on the drawings.

3.2 Duct liner:
- A. Line heating and air conditioning return rectangular trunk ducts within 20 feet of the AHU's:
  1. Thickness - 1/2".
  2. Duct sizes shown on drawings are outside sheet metal dimensions.
- B. Do not line supply, exhaust and outside air intake ducts.
- C. Install in accordance with SMACNA duct liner application standards and as follows:
  1. Cut and thoroughly coat edges with adhesive.
  2. Butt joints tightly.
  3. Top and bottom sections shall overlap side sections.
  4. Secure to clean ductwork with adhesive at 90 percent coverage.
  5. Additionally secure with mechanical fasteners installed as follows:
     - a. Transversely (across duct) - 3" from corners and at intervals not exceeding 12" on center.
     - b. Longitudinally (along duct) - 3" from transverse joints and at intervals not exceeding 18" on center.
     - c. Ducts less than 8" in interior width do not require fasteners.
  6. Keep liner clean and free from dust. Repair tears with mastic.

3.3 Flexible duct connectors:
- A. Provide flexible duct connections at:
  1. Fans/ERV's over 1/6 hp.
  2. AHU'S
  3. RTU - use flame retardant types.
- B. Maintain 2" minimum clearance between the adjacent galvanized sheet metal ducts.
- C. Install to minimize air leakage.
- D. Support ductwork within 12" of flexible duct connection. Flexible duct connections shall not support ductwork.

3.4 Flexible refrigerant connectors:
- A. Provide on suction and discharge piping at each condensing unit over five tons capacity.
- B. Piping insulation shall cover suction piping flexible connector.

3.5 Vibration isolators:

A. Provide isolators for equipment as follows:
   1. Pumps - Type A
   2. Upflow Air handling units - Type A
   3. ERV - Type E
   4. Condensing units on roof - Type A
   5. Rooftop units - Type C

B. Size isolators in accordance with the weight distribution of equipment and manufacturer's recommendations to produce uniform deflection.

3.6 Flexible pump connectors:

A. Provide on suction and discharge piping adjacent to pumps greater than 3/4 horsepower.

3.7 Sound Attenuators:

A. Secure to ductwork.

B. Clean interiors

END OF SECTION 15240

SECTION 15 250 - INSULATION

1. GENERAL

1.1 Work included:
- A. Pipe insulation
- B. Duct insulation
- C. Lavatory supply & waste insulation

1.2 Quality Assurance:
- A. Installer for the insulation systems shall have been engaged in the installation of insulation for similar type projects for at least five years.
- B. Insulation shall meet or exceed minimum fire ratings and be rated for use in ceiling return air plenums as applicable.

2. PRODUCTS

2.1 Pipe insulation:
- A. Fiberglass with all-service jacket, vapor barrier and self sealing lap.
  - 1. Acceptable manufacturers: Certainteed, Johns-Manville, Knauf, or Owens-Corning.
- B. Elastomeric: closed cellular, preslit rubber tubes.
  - 1. Acceptable manufacturers: Armstrong, Halstead, or Rubatex.
- C. Elbow covers - prefabricated fittings, plenum rated as required.
  - 1. Acceptable manufacturers: Certainteed, Knauf, Proto or Zeston.

2.2 Duct insulation:
- A. Inside the building duct wrap:
  - 1. Fiberglass, with reinforced foil faced scrim Kraft facing with density of one lb/cu.ft. for interior use.
  - 2. 3/8" thick foil faced air cell insulation for interior use.
  - 3. Acceptable manufacturers: Certainteed, Johns-Manville, Knauf, Owens-Corning or Reflectix.
- B. Exterior duct insulation:
  - 1. Two layers of 1" thick closed cell rubber insulation sheet, with top layer overlapping the sides. Mechanical fasten insulation at 18" centers. Provide a EPDM rubber jacket sealed weathertight over the insulation. Provide blocking on top of the duct to pitch insulation on top at 5%.

2.3 Lavatory supply and waste insulation
- A. Molded closed cellular vinyl.
- B. Acceptable manufacturers: Truebro Inc. Model #102W.

3. EXECUTION

3.1 Pipe insulation:
- A. Type and size of insulation shall be as follows:
  - 1. Domestic water piping - CW - 1/2" fiberglass pipes up to 1" diameter. 1" thick fiberglass for pipe sizes up to 3" diameter.
  - 2. Domestic water piping - HW - 1" thick fiberglass.
  - 3. Refrigerant Piping - 1.5" closed cell rubber.
  - 4. Interior horizontal condensate drain - ½" thick closed cell rubber or fiberglass.
  - 5. Above slab heating water supply and return - 1.5" thick fiberglass
  - 6. Below slab heating water supply and return piping under spaces not requiring the slab heat - 1.5" thick closed cell rubber.
  - 7. Insulate horizontal storm piping and the first 10 feet vertical drop after the horizontal pipe, with 1" thick fiberglass with all service jacket.

B. General:
   1. Insulate piping, valves, tees, and fittings.
   2. Secure insulation with adhesive and seal joints with sealant.
   3. Do not compress insulation or use tape or plastic ties.
   4. Insulation shall be continuous through walls, sleeves, hangers and supports.
   5. Provide 16 gage x 10" long galvanized steel shield at piping supports to minimize compression of insulation.
   6. Install pre-fitted plastic elbows and tees or apply canvas jacket in three layers at elbows.
   7. Do not puncture vapor barrier on cold piping insulation.
   8. If support penetrates vapor barrier, insulate support and seal to pipe insulation.
   9. Paint exterior refrigerant piping insulation with two coats of Rubatex `374' or equal.

C. Project closeout:
   1. Clean dirt, dust and debris from insulation surfaces.
   2. Repair defects in insulation surface or jacket.
   3. Label pipe insulation as designated in Section 15190.

3.2 Duct insulation:

A. Insulate heating, ventilating, and air conditioning ducts as follows:
   1. Supply, exhaust air, outside air and return air ducts when installed inside building insulation envelope with 2" thick fiberglass duct wrap or with foil faced air cell insulation, minimum R=5.0 installed.
   2. Supply and return air ducts when installed outside the building insulation envelope with 3" thick fiberglass duct wrap, min. R=8.0 installed.
   3. Secure insulation to ductwork with Foster adhesive at 50 percent coverage and with 3" wide SMACNA approved FSK tape.
   4. Exterior supply air, exhaust air, return air and outside air, insulate with the 2" rigid exterior grade insulation/jacket.

B. Do not puncture vapor barrier.

C. Do not compress insulation except in areas of structural interference.

D. For rectangular ducts over 14" wide, fiberglass duct wrap shall be additionally secured to duct with mechanical fasteners and washers on 12" centers.

E. Penetrations through the facing shall be sealed with vapor barrier mastic.

F. Duct coverings shall not extend thru walls, floors or ceilings required to be firestopped.

G. Duct coverings shall not conceal any service opening unless a permanent label is affixed to insulation locating the exact position of the opening.

3.3 Lavatory supply and waste insulation:

A. Insulate waste piping and water supply lines beneath handicapped lavatories and sinks.

END OF SECTION 15250

SECTION 15 330 - FIRE PROTECTION

1. GENERAL

1.1 Work included:

A. Automatic sprinkler systems to include:
   1. Water type fire suppression system for the new addition, including required standpipes and fire pumps.
   2. Chemical type fire suppression system for the IT Computer Room.

1.2 Quality assurance:

A. Comply with NFPA Standard 13 and other applicable sections.
B. Comply with local building official requirements.
C. Comply with Owner's insurance underwriter's requirements.
D. Equipment shall be UL Listed and FM approved.

1.3 Submittals:

A. Submit shop drawings to Authority having jurisdiction, obtain approved and stamped drawings, then submit to Owner's representative for approval.
B. Shop drawings shall include the following:
   1. Drawings, cuts and catalog information showing dimensions, weight, performance, etc. of equipment.
   2. Schedules of equipment shall show manufacturer.
   3. Drawings and details showing piping, drains, valves, sprinklers, etc. for complete fire protection system.
   4. Include the manufacturer's name, model numbers or other means of identification, of pipe, fittings, valves, etc., required for the installation of the work.

1.4 Contractor's Qualifications and Responsibilities:

A. The Contractor providing the fire suppression system shall have been engaged in the installation of similar projects of equivalent size for at least five years.
B. Provide complete fire suppression systems. Piping in areas subject to freezing shall be protected by heat tape, anti-freeze solution, or a dry pipe system.

2. PRODUCTS

2.1 Systems Description:

A. Building system shall be a wet pipe except where required to prevent freezing.
B. Size and distribution determined from Hydraulic calculations as per NFPA or Owner's insurance underwriter whichever is more stringent.
C. Provide electric fire pump and electrical service for fire pump as required by field conditions.
D. Provide a complete chemical flooding type fire suppression system for the IT computer room including sensors, control cabinet, chemical agents, nozzles and alarms.

2.2 Equipment:

A. Acceptable manufacturers are: Automatic, Grinnell, Reliable, Potter-Roemer or Viking.
B. Equipment and materials shall be as follows:
   1. Piping - per NFPA
   2. Control valve - OS&Y gate valve
   3. Sprinkler heads (in finished areas) - U L Listed, semi-recessed, white finish, quick response type, 165F rated link.
   4. Sprinkler heads (in unfinished areas) - U L Listed, brass, upright, quick response type, 212F rated link.
   5. Spare sprinkler heads - per NFPA 13 Art. 3-16.7 + wrench
   6. Water Flow Indicators - U L Listed Flowswitch
   7. Inspectors test outlet - Minimum of one required per alarm valve - verify location with Architect.
   8. Flow test & main drain - as per NFPA 13
   9. Pipe supports - As per NFPA 13 and Section 15140
   10. Tamper switches - U L Listed and compatible with sprinkler alarm system

11. Accessories - Spare head cabinet, Pressure gage. Provide six type of spare sprinkler heads for each type and rating used.
12. Air compressor - min. 20 gallon tank with neoprene isolation and flexible pipe connections.
13. The IT Computer Room system to be aerosol type or a gaseous clean agent type approved by NFPA, EPA with a lock-out/abort switch, manual pull station, heat sensor, microprocessor controller.
14. Standpipes in stairwells and on roof per code requirements.
15. Fire pump with electric service as determined by field conditions and code requirements.

3. EXECUTION

3.1 Installation:

A. Routing of piping shall be parallel to building members.
B. Provide fittings and offsets as required by field conditions at no additional cost to the Owner.
C. Comply with manufacturer's instructions for installation of materials and equipment.
D. Coordinate with other trades to avoid conflicts.
   1. Route piping to accommodate other trades.
E. Cut ceiling and tiles and install ceiling mounted heads - mount square and plumb.
   1. Provide flush mounted, chrome plated escutcheons at penetration through ceiling.
   2. Install heads in center of ceiling tiles as practical - verify with Architect.
F. Secure sprinkler risers to structure.
G. Interlock alarm valve and tamper switches with sprinkler alarm system.
   1. Provide electrical supervisor switches for shut-off valves.
H. Provide hose end drain valves at all low points in piping system.
   1. Extend drains to exterior - verify termination points with the Architect.
I. Test systems in accordance with NFPA Standard 13 and other applicable standards.
J. Verify location of chemical fire system components with Owner.
K. Assure proper operation and service access for the fire pump with accessories.

END OF SECTION 15330

SECTION 15 410 - PLUMBING PIPING SYSTEMS

1. GENERAL

1.1 Work included:
- A. Domestic water system
- B. Sanitary waste & vent system
- C. Condensate drain

2. PRODUCTS

2.1 Domestic water:
- A. Type L copper with no lead solder.

2.2 Sanitary drainage and Storm:
- A. Cast iron or Sched. 40 PVC. Above grade risers to be cast iron.

2.3 Sanitary vent:
- A. galvanized steel; or,
- B. copper DWV with 50/50 solder, or
- C. Sched. 40 PVC

2.4 Condensate drains:
- A. Type L copper.
- B. Schedule 40 PVC

3. EXECUTION

3.1 Preparation:
- A. Field verify suitability of inverts and exact location of piping at suggested points of connection prior to rough-in of work.

3.2 Installation:
- A. Provide condensate drain piping for FC's, RTU and AHUs' evaporator coil and extend to the exterior or hub drain. Provide condensate pumps as required.
- B. Install piping as high as possible and maintain required slope.
- C. Do not use plastic piping in return air plenums.

3.3 Testing & Cleaning:
- A. Leak test drainage, waste & vent piping systems with 5 psig compressed air or 10 foot water column for 12 hours.
- B. Leak test water piping systems with 100 psig compressed air for 24 hours.
- C. Flush water piping with potable water.
- D. Sterilize domestic water piping in accordance with the Virginia State Board of Health.
  1. Submit water samples for testing if required.

END OF SECTION 15410

SECTION 15 440 - PLUMBING FIXTURES, SPECIALTIES, & EQUIPMENT

1. GENERAL

1.1 Work included:
- A. Plumbing fixtures
- B. Fixture supports
- C. Plumbing appliances
- D. Plumbing equipment

2. PRODUCTS

2.1 Plumbing fixtures, supports, appliances, and equipment shall be as specified on the drawings or equal by an acceptable manufacturer listed herein.

2.2 Acceptable Manufacturers:
- A. Water Closets - Toto, American Standard or Kohler
- B. Closet Seats - Olsonite, Bemis or Church
- C. Urinals - Toto, American Standard, Eljer, or Kohler
- D. Lavatories - Toto, American Standard or Kohler
- E. Faucets - Bradley, Chicago, Delta, Moen, or Symmons
- F. Stainless Sinks - American Standard, Elkay, Dayton, or Moen
- G. Mop Basins - Fiat, Swan, or Stern-Williams
- H. Water Heaters - State, American, Eemax
- I. Cleanouts, Floor Drains, Roof drains - Josam, J.R. Smith, Wade, Zurn

2.3 Supply stops: Chrome plated brass, quarter turn

2.4 Traps: Chrome plated brass, 17 gauge, P- trap with cleanout plug.

3. EXECUTION

3.1 Rough-in Installation:
- A. Refer to Section 15410 for installation requirements of piping systems.
- B. Verify exact location of fixtures and drains prior to rough-in.

3.2 Fixture Installation:
- A. Install handicapped fixtures as per ADA.
- B. Provide chrome plated, 1/4 turn stops for fixtures.
- C. Provide chrome plated nipples from piping in wall to stops where exposed.
- D. Provide bolt caps for water closets.
- E. Provide chrome plated tailpiece and trap with cleanout for lavatories and sinks.
  1. Provide grid strainer for lavatories.
  2. Provide removable basket strainer for sinks.
- F. Mount plugged outlets and wall cleanouts at 18" above finished floor.
- G. Mount hose bibbs and wall hydrants at 36" above finished grade.
- H. Install cleanout to grade in accordance with detail on drawings.
- I. Water heater installation:
  1. Provide shut-off valves and unions on hot and cold piping - refer to diagram on drawings.

3.3 Project Closeout:

A. Caulk joints between fixtures and finished surfaces with white, silicone caulk.
B. Clean dirt and debris from appliances, fixtures and equipment.
C. Polish chrome finish at completion of project.

END OF SECTION 15440

SECTION 15510 - HYDRONIC PIPING

1. GENERAL

1.1 Work included:
- A. Heating water

2. PRODUCTS

2.1 Heating water (supply and return):
- A. Above slab use:
  - 1. Schedule 40 steel with screwed, welded, or flanged fittings;
  - 2. Type L copper with 95/5 solder
- B. Under slab use:
  - 1. PE Wirsbo-pe PEX1 with Everloc fittings - refer to Equipment List on drawings.
- C. Piping Manifolds:
  - 1. Equipped with vent connections and isolation valves for each underslab piping loop, sized for max. 5 ft. hd. pressure drop at required flow rates.

3. EXECUTION

3.1 Preparation:
- A. Ream pipe ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 Installation:
- A. Route piping in orderly manner, plumb and parallel to building structure and maintain gradient.
- B. Install piping to conserve building space and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Isolate piping from building members.
- E. Provide clearance for installation of insulation and access to valves and fittings.
- F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Architect.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Secure piping manifolds from structure and install to allow proper service access.
- J. Joints in underslab piping are not allowed, except when pipe is damaged the Everloc fitting can be used to repair the joint. Secure underslab piping to prevent movement during pouring of concrete. Provide 1" thick water resistant rigid insulation board under the slab radiant heat and the snow melt piping in the sidewalks.

3.3 Application:
- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide 3/4" gate or ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.
- E. Provide air vent at high points in piping systems.

3.4 Testing and filling:
- A. Test hydronic water piping upon completion of the entire system.

1. Test hydrostatically to pressure not less than 50% in excess of the maximum pressure to which the pipe will ordinarily be subjected, but in no case less than 100 psi.
2. Maintain full test pressure for a period of not less than 8 hours.
3. Repair or replace any leaks or defective pipe disclosed by the tests.
4. Repeat tests until all piping shows tight.
5. Connect boiler, pump, etc. to piping systems after satisfactory cleaning of pipe systems.

3.5 Testing and balancing:

A. Provide Independent Testing and Balance of flowrates in hydronic piping systems after all equipment is connected and operating in accordance with NEBB Standards.
B. Balance flows to rates indicated on drawings.
C. Provide report of indicating initial, final and design flows.
   1. Bind report in plastic cover.

3.6 Cleaning:

A. Near completion of project, prior to connecting equipment, thoroughly flush drain, rinse and treat hydronic water circulating systems as instructed by water treatment manufacturer for each particular system.
   1. System Cleaner -Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
   2. Closed System Water Treatment :
      a. Sequestering agent to reduce deposits and adjust pH.
      b. Corrosion inhibitors.
      c. Conductivity enhancers.
   3. Chemical treatment system: (one for each piping loop)
      a. By-pass (Pot) Feeder: 5.0 gal. quick opening cap for working pressure of 175 psig.
      b. Provide feeder with filter fabricated of polyester cloth capable of removing solids of 5 micron size at differential of 20 psig.
B. Conform to applicable EPA code for addition of non-potable chemicals to building mechanical systems, and for delivery to public sewage systems.
C. Provide laboratory and technical assistance services for warranty period.
D. Include two hour training course for operating personnel, instructing them on installation, care, maintenance, testing and operation of water treatment systems.
   1. Arrange course at startup of systems.
D. Provide sufficient chemicals for treatment and testing during warranty period.
E. Replace filters after system cleaning.

END OF SECTION 15510

SECTION 15530 - REFRIGERANT PIPING

1. GENERAL

1.1 Work included:
- A. Piping
- B. Piping specialties

2. PRODUCTS

2.1 Piping:
- A. Type L copper, cleaned & capped with silver solder; or,
- B. Type ARC copper with silver solder.

2.2 Fittings:
- A. Wrought copper with long radius elbows.

2.3 Suction line traps:
- A. Manufactured one-piece.

3 EXECUTION

3.1 Installation:
- A. Slope suction lines down toward compressor at one inch per 10 feet.
- B. Locate traps at vertical rises against flow.
- C. Any piping which exceeds 30" horizontal exterior run support piping between building and outdoor units on a continuous, weather-resistant, welded steel, pipe rack. Clamp to rack at 18 inch intervals.
- D. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.
- E. Refer to additional notes on the drawings for VRF related installation work.
- F. Special requirements are necessary for underground refrigerant piping installation - refer to notes on the drawings and isolate from underground line voltage conduits.

3.2 Testing and charging:
- A. Leak test piping with freon and halide leak detector.
- B. Charge piping per equipment manufacturer's recommendations.

END OF SECTION 15530

SECTION 15557 - BOILER

1. GENERAL

1.1 Work included:
- A. Boiler

1.2 Warranties:
- A. Heat exchanger shall carry a ten year limited warranty against failure caused by defective workmanship or material.

1.3 Codes and Standards:
- A. Boiler shall be A.G.A. or U.L. approved and listed.
- B. Boiler shall meet the energy efficiency standards of ASHRAE 90A-1980.
- C. The boiler shall bear the ASME "H" stamp and shall be National Board listed for 160# working pressure and 250F temperature.

1.4 Regulations:
- A. Contact Owner's insurance agency for requirements of the boiler fuel train approvals (UL, FM or IRI).

2. PRODUCTS

2.1 Equipment:
- A. Design is based on Lochinvar Knight Boiler
- B. Refer to drawings for capacities and features.
- C. Acceptable alternate manufacturer's are: Thermific, Fulton, Weil McLain
- D. BMS Gateway to Bacnet

2.2 Standard features and options:
- A. Pressure vessel - ASME stainless steel heat exchanger, with necessary inspection openings as required by the ASME Boiler and Pressure Vessel Code, insulation in place, drain line, inlet and outlet threaded pipe fittings, ASME safety relief valve. A zinc coated metal jacket painted with two coats of heat resistant paint be provided.
- B. The electrical power compartment shall be equipped to facilitate natural air circulation, microprocessor controller, 120 vac,
- C. Direct vent sealed combustion, 10:1 turndown ratio, 96.3% thermal efficiency, PVC venting and combustion air, direct spark ignition,
- D. Standard control equipment shall include: PLC controller, control aquastat, manual reset electric hi-limit, manual reset low water cut-off, 24 vac control transformer with fuses located in the electric compartment, an on-off switch, inlet and outlet temperature sensors, outdoor reset sensor, pump relay.
- E. Options to include a flow switch, boiler drain valve, alarm silencing switch, and condensate neutralization kit, concentric vent kit, injection pumps.

3. EXECUTION

3.1 Installation:
- A. Coordinate size of house cleaning pad required with Division 3, min. 3" thick.
- B. Install boiler on house cleaning pads.
- C. Maintain 36" clearance at front panel and removable access panel for element removal.
- D. Extend drain tubing to floor drain.
- E. Connect PVC flue and combustion air vent piping and extend to wall termination.
- F. Connect heating water supply and return piping to boiler.
- G. Fill the boiler with water to assure it is not "air bound."
- H. Install flow switch and level controls.

3.2 Project Closeout:

A. Operate boiler only after system has been filled with water.
B. Clean unit casing with industrial cleanser and repair defects in finish.
C. Using a combustion gas analyzer, test boiler for proper combustion performance as per manufacturer's instructions.
D. Provide start-up as per manufacturer's recommendation.

END OF SECTION 15557

SECTION 15774 - DUCTED SPLIT SYSTEM HEAT PUMPS

1. GENERAL

1.1 Work included:

A. Indoor/Outdoor unit and controls, including the variable refrigerant systems referred to VRF or VRV.

1.2 Warranty:

A. Provide 5 year written non-prorated unit parts warranty.
   1. Provide stamped brass tag affixed to unit in a visible location.
   2. Tag shall indicate warranty expiration date.

2. PRODUCTS

1.1 Acceptable manufacturers:

A. LG, Daikin, Panasonic, Fujitsu.

1.2 Equipment:

A. Equipment to be ETL or UL Listed and AHRI approved.
B. Refer to drawings for capacities and model numbers.

1.3 Standard features and options:

A. Air Handling Unit:
   1. Insulated housing, hinged return air filter rack (ducted unit), integral drain pan with primary and secondary overflow connections. Recessed ceiling units to have integral condensate pump and grille cover, and ventilation kit as specified.
   2. Evaporator coil - copper tube with aluminum fins.
   3. Blower shall be statically and dynamically balanced, with - 100,000 hours bearing life, internal spring isolation as applicable, variable speed type.
B. Outdoor unit:
   1. Heavy gauge galvanized steel, weatherproof construction, support base, primed with baked enamel finish.
   2. Condenser coil - copper tube with aluminum fins, variable speed propeller fan and condenser guard.
   3. Factory terminal blocks, control transformer in a weatherproof compartment.
   4. Compressor - inverter drive scroll type with R-410A refrigerant, anti-short cycle timer/relay, high and low pressure switches, thermal overload relays, suction accumulator. Provide low ambient cooling controls, and a phase monitor for the three phase units.
C. Distribution boxes shall be 208 volt, with connections for refrigerant piping to the air handling units. Each refrigeration circuit to the indoor units shall be equipped with isolation valves at the distribution boxes to assist in service work.

3. EXECUTION

3.1 Installation:

A. Install outdoor units on ground on concrete pads. Install the outdoor units on the roof on structural steel supports.
B. Support ducted air handling units from structure with all thread steel rods and vibration isolators. Support other units from the structure with wall bracket or all thread steel rods.
C. Provide drain pan with a float switch, beneath the ducted air handling units.
D. Maintain required clearance around perimeter and top of units. Install top of unit level.
E. Install refrigerant piping between outdoor unit and evaporative coil; connect, evacuate and charge system as per manufacturer's recommendations. Provide wye fittings and distribution boxes as required by the manufacturer for a complete working system.
F. Connect ductwork, control wiring and condensate drain piping to air handling unit as applicable.

3.2 Project closeout:

A. Comb bent coil fins of the outdoor unit, and spray wash with hot water and detergent. Clean and repair panels/finish of the indoor units.
B. Provide factory authorized start-up, and testing of refrigeration equipment.
C. Submit complete test report of equipment performance (ie: air temperature, suction and discharge pressures, air flow, electrical characteristics) under various load conditions.
D. Report shall be bound in plastic folder.

END OF SECTION 15774

SECTION 15 780 - COMPUTER ROOM AC UNIT

1. GENERAL

1.1 Work included:
- A. Indoor DX cooled AC unit and outdoor condenser

1.2 Warranty:
- A. Provide a two year complete system parts warranty and a 5 year written non-prorated compressor parts warranty.
  - 1. Provide stamped brass tag affixed to unit in a visible location.
  - 2. Tag shall indicate warranty expiration date.

2. PRODUCTS

2.1 Acceptable manufacturers:
- A. Liebert
- B. Advanced Enviro Solutions (AES)

2.2 Equipment:
- A. Basis of design is Liebert
- B. Refer to drawings for capacities and model numbers.

2.3 Standard features and options:
- A. In rack Floor Standing, Single Refrig. Circuit
  - 1. Compressor - scroll with crankcase heaters, anti-short cycle timer/relay, high and low pressure switches, thermal overload relays, reversing valve, refrigerant line filter driers, thermostatic expansion valve
  - 2. Controls - factory mounted and wired with control transformer, motor start protectors, non-fused disconnect switch, C6000 Advanced Microprocessor Controller (graphical backlit LCD Display)
  - 3. Casing - primed and finished with baked enamel, insulated, top front discharge plenum with rear return.
  - 4. ECM variable speed blower, with Merv 8 return air filter.
  - 5. Electrode pure steam canister humidifier with proportional control and integral humidity sensor in return airstream.
  - 6. Provide refrigeration isolation valves
  - 7. Refer to drawings for additional features.

3. EXECUTION

3.1 Installation:
- A. Secure indoor unit to computer racks.
- B. Maintain required clearance around perimeter.
- C. Connect refrigerant piping with flexible pipe connections to unit after completion of cleaning sequence.
- D. Provide condensate drain piping and extend piping to discharge at hub or floor drain.
- E. Set the outdoor unit on structural steel supports.

3.2 Project closeout:
- A. Replace filters at time of project turnover to Owner.
- B. Provide factory authorized start-up and testing of equipment.
- C. Submit complete test report of equipment performance (ie: air temperature, suction and discharge pressures, air flow, electrical characteristics) under various load conditions.
- D. Report shall be bound in plastic folder.

END OF SECTION

SECTION 15 785 - ROOFTOP AC UNIT

1. GENERAL

1.1 Work included:
- A. Packaged roof mounted air conditioner
- B. Mounting support rail.

1.2 Quality assurance:
- A. Equipment design shall be AGA certified.
- B. Cooling capacity shall be rated at ARI conditions.

1.3 Warranty:
- A. Provide 5 year non-prorated written compressor warranty.
- B. Provide 10 year non-prorated written heat exchanger warranty.
- C. Provide equipment tag indicating warranty expiration dates.

2. PRODUCTS

2.1 Acceptable Manufacturers:
- A. Carrier
- B. Lennox
- C. Johnson
- D. Daikin
- E. Trane

2.2 Equipment Capacities:
- A. Design is based on Johnson.
- B. Refer to drawings for model numbers and capacities.

2.3 Standard Features and Options:
- A. Cabinet: double walled, insulated, baked enameled steel, weatherproof finish, accessible filter rack; economizer outside air damper, barometric relief air damper.
- B. Compressor: sealed hermetic, low pressure switch, anti-short cycle timer relay, current overload protection, Cycle-LOC circuitry, crankcase heaters, vibration isolators.
- C. Evaporator: aluminum fins bonded to copper tubes.
- D. Burner/heat exchanger: aluminized steel burner chamber, forced draft with electronic ignition, aluminized steel heat exchanger with internal turbulators. Multi-stage burners as indicated on drawings.
- E. Heating control: redundant gas valves, safety limit switches, centrifugal and rollout switches.
- F. Blower: forward curved, belt-drive, with adjustable pitch pulley, fan time-delay relay.
- G. Electrical controls: condenser fan, evaporator fan and compressor contactors and low voltage control transformer.
- H. Condensate trap: min. 5" deep, field provided. Fill with heavy mineral oil.
- I. Filters: Merv 8 disposable fiberglass.

3. EXECUTION

3.1 Installation:

A. Install unit on vibration isolators on steel rails.
B. Connect control wiring and gas piping.
C. Connect ductwork with flame retardant flexible duct connectors.
D. Field install barometric relief air damper.

3.2 Project Closeout:

A. Comb condenser fins and replace/repair bent panels.
B. Provide factory authorized start-up and testing and submit three copies of written report.

END OF SECTION 15785

SECTION 15 860 - FANS AND ERV'S

1. GENERAL

1.1 Work included:
- A. Exhaust fans and ERV's

1.2 Quality assurance:
- A. Fan capacity shall be AMCA rated and UL approved.
- B. ERV to be AGA and ARI certified.

2. PRODUCTS

2.1 Acceptable manufacturer's:
- A. Acme
- B. Twin City
- C. Cook
- D. Greenheck
- E. Valent
- F. Semco
- G. Z duct

2.2 Equipment:
- A. Design is based on manufacturer's and model numbers listed on the drawings.

2.3 Standard features and options:
- A. Fans:
  1. Provide backdraft dampers and safety switches for fans.
- B. ERV:
  1. Cabinet: double walled, insulated, baked enameled steel, weatherproof finish, accessible filter rack, outside air and exhaust air hoods with aluminum mesh air filters.
  2. Compressor: sealed hermetic, low pressure switch, anti-short cycle timer relay, current overload protection, Cycle-LOC circuitry, crankcase heaters, vibration isolators.
  3. Evaporator: aluminum fins bonded to copper tubes.
  4. Burner/heat exchanger: aluminized steel burner chamber, forced draft with electronic ignition, aluminized steel heat exchanger with internal turbulators. Multi-stage burners as indicated on drawings.
  5. Heating control: redundant gas valves, safety limit switches, centrifugal and rollout switches.
  6. Blowers: forward curved, VFD drive, fan time-delay relay.
  7. Electrical controls: condenser fan, evaporator fan and compressor contactors and low voltage control transformer.
  8. Condensate trap: min. 5" deep, field provided. Fill with heavy mineral oil.
  9. Filters: Merv 8 disposable fiberglass on the inlet air of both airstreams to the heat exchanger.
  10. Plate type heat exchanger with desiccant coating with efficiencies as stated on the drawings.

3. EXECUTION

3.1 Installation:

A. Support fans from structure with metal strapping or all thread steel rods.

B. Connect ductwork - use flexible duct connectors for fans over 1/3 hp. Install backdraft dampers and assure proper operation for fans.

C. ERV:

1. Set ERV curb on roof and flash as required.
2. Set vibration isolation rail on curb, then set ERV on the vibration isolation rail.
3. Connect ductwork with flame retardant flexible duct connections.
4. Connect controls, install duct mounted pressure sensor and space humidity sensor.

3.2 Project closeout:

A. Replace filters in ERV's at time of project turnover to the Owner.

B. Test performance of fans and ERV's, and submit written report of test results.

C. Comb ERV condenser fins and replace/repair bent panels.

D. Provide factory authorized start-up and testing and submit three copies of written report.

END OF SECTION 15860

SECTION 15 890 - DUCTWORK

1. GENERAL

1.1 Work included:
- A. Ductwork
- B. Duct hangers and supports

1.2 Quality assurance:
- A. Fabricate components of the hvac duct system (transitions, elbows, branch take-offs, etc.) per SMACNA recommendations for pressure classifications as follows:
  1. Ducted Air handling units:
     - a. Supply air ductwork - 2" wc.
     - b. Return and outside air ducts - 2" wc.
  2. RTU and ERV:
     - a. Supply air ductwork - 6" wc.
     - b. Return and exhaust air ducts - 6" wc.
- B. Firm performing testing and balancing of air distribution systems shall be AABC or NEBB certified, independent of the HVAC Contractor

1.3 Codes and Standards:
- A. NFPA 90A - Air Conditioning and Ventilating Systems
- B. SMACNA duct construction standards

2. PRODUCTS

2.1 General:
- A. Maximum angle of offsets, reductions or enlargements: 30 degrees.

2.2 Flexible preinsulated ductwork (supply ducts only):
- A. Standard manufactured product of Flexmaster, Masterduct or Wiremold as follows:
  1. Maximum length: 8 feet (use rigid steel ducts for remainder of runouts)
  2. Insulation: 1 lb/cu. ft. density - refer to insulation specifications for thickness requirements.
  3. Vapor barrier: Fire retardant vinyl
  4. Duct: Trilaminate foil and mechanical lock steel spiral (use of adhesives to secure duct to spiral is not allowed)
  5. Construction Standards: U L 181 Class 1, NFPA 90A
  6. Working Pressure: 6"
  7. Connection to trunk duct: combination damper/extractor/spin-in w/ locking lever. Position locking lever on bottom of duct or at location to allow ease of balance. Ventlok, Duro-dyne or equal.
  8. Joint sealant: UL Listed Foster Mastic
  9. Support: 1" wide bands @ 48" OC max.

2.3 Round or rectangular metal ductwork:
- A. Shop fabricated as follows:
  1. Materials: Galvanized steel sheet, ASTM A 527-85
  2. Construction: per SMACNA HVAC Duct Construction Standards and VUSBC M-301.4
  3. Joint Sealant: UL 181 mastic, Hardcast FTA-20, Kingco 18-136.
  4. Elbows: Radius elbows type with minimum Radius: Width (R/W) ratio of 1.5 or square elbows with single thickness turning vanes with trailing edge.
  5. Provide reinforcing angles and rods for larger ducts per SMACNA guidelines to prevent buckling, breathing, vibrations and unnecessary noise.

2.4 Duct hangers:

A. 1" x 18 ga. galvanized steel straps or 3/8" steel rods and angle iron.

3. EXECUTION

3.1 Preparation:

A. Verify routing of ducts and coordinate with building structure and other trades prior to fabricating ductwork.

3.2 Installation:

A. Install internal ends of slip joints in direction of air flow.
B. Seal joints, seams, screws and rivets in ductwork and casings airtight.
   1. Coat with UL Listed sealant or cover with UL Listed FSK duct tape.
C. Branch duct take-offs shall use a full size tap at a 45 degree angle or a direct 90 degree tap with a 45 degree angle beveled throat clinch collar. Collars shall be screwed to the trunk duct.
D. Branch ducts to grilles directly below trunk duct shall be full neck size.
E. Paint interior of duct where visible with flat black paint at air outlets and inlets.
F. Cap duct openings during construction.
G. Attach flexible duct to spin-in collars/rigid duct with mastic and secure flexible duct with 1/2" wide drawband and FSK duct tape.
H. Maximum sag of flexible duct shall not exceed 1/2" per foot of support spacing.
   1. Support system shall not damage duct or cause out of round shape in flexible duct.
   2. Use hard round duct for branch duct runouts exceeding eight feet.
   3. Cut and remove excess length of unused duct.
I. Install duct hangers as follows:
   1. Close to transverse joints on trunk ducts.
   2. Locate at ducts penetrating wall as though wall will not contribute to the support of the duct.
   3. In pairs at exact opposite sides of duct.
   4. Provide at least one set of hangers for short duct branches three feet or less in length.
   5. Locate 2-24 inches from flexible connections and 2-12 inches from ends of all branch duct.
   6. At changes in duct direction
   7. Hanger spacing shall be as follows:
      a. Up to 4 sq. ft. in area - 8' on center
      b. 4.1 to 10 sq. ft. in area - 6' on center
      c. 10.1 to 16 sq.ft. in area - 4' on center
J. Do not bear ducts on structural members or ceiling.
K. Insulate ducts per section 15250.

3.3 Project closeout:

A. Provide Independent Test and Balance of the air distribution system and equipment in accordance with AABC or NEBB recommendations.
   1. Submit 3 complete reports indicating initial air balance CFM, design CFM and final air flow CFM, and final face velocities at inlets and outlets for each zone. Include minimum outside air cfm's. Include AHU totals and outside air cfm quantities, and exhaust air quantities.
   2. Bind each report in plastic folder.

END OF SECTION 15890

SECTION 15 910 - DUCTWORK ACCESSORIES

1. GENERAL

1.1 Work included:
- A. Dampers
- B. Access doors

1.2 Quality assurance:
- A. Fire and motorized dampers shall be UL approved.

1.3 Codes and Standards:
- A. SMACNA duct construction standards.

1.4 Submittals:
- A. Provide submittals in accordance with Division 1 on:
  - 1. Dampers
  - 2. Access doors

2. PRODUCTS

2.1 Acceptable manufacturer's:
- A. Dampers:
  - 1. Advanced Air, Cesco, Prefco, Pottorf, Ruskin, Safe-Air or Honeywell.
- B. Access doors:
  - 1. Cesco, Louvers and Dampers, Kees, Inc., or Air Balance.

2.2 Equipment:
- A. Relief and backdraft dampers:
  - 1. Parallel blade design with frame
  - 2. Aluminum mill finish
  - 3. Foam gasketed blades
  - 4. Nylon bushings
  - 5. Full 90 degree operation
  - 6. Adjustable counterbalance
- B. Control dampers:
  - 1. 16 ga. galvanized steel
  - 2. Rubber blade edges
  - 3. Bronze Oilite bearings
  - 4. Zinc plated pivot pins
  - 5. Opposed blade type
  - 6. Leakage rate of one percent of rated flow
  - 7. Size operators with a 50 percent safety factor
- C. Volume dampers:
  - 1. 16 ga. galvanized steel
  - 2. Blade width shall not exceed 12"
  - 3. For duct dimensions larger than 12" use a multi-vane type damper
  - 4. Low leakage type with locking quadrant
  - 5. Linkage and actuators to be mounted outside of airstream
- D. Fire dampers:
  - 1. Type B, blade pocket outside of air stream
  - 2. Sleeve for connection of ductwork
  - 3. 212°F rated link
  - 4. 22 ga. galvanized steel
  - 5. UL approved for dynamic rating
  - 6. Horizontal units shall have negator closure spring

7. Damper rating: same rating as rated wall or ceiling in which it is located.

E. Splitter dampers:
1. 16 ga. galvanized steel
2. Single panel type
3. Full height of ductwork
4. Length shall be size of largest duct dimension
5. Continuous hinge
6. Pushrod with locking quadrant on exterior of

F. Access doors:
1. Factory built with sash locks, butt hinge, gasket, 24 ga. door and 22 ga. frame.
2. Access doors in insulated duct shall be double construction, with insulation encased.
3. Access door in med. velocity duct shall be rated to 10" wc.
4. Minimum size shall be 18"x18" or 80% the size of the duct in which installed, of adequate size to provide proper service access to the device.
5. Basis of design: Cesco Model HAD-10.

3. EXECUTION

3.1 Installation:

A. Dampers:
1. Push rod for volume dampers and splitter dampers shall be mounted in an accessible location on the exterior of the duct.
2. Install backdraft dampers and motorized control dampers to all proper operation and service access. Mark the end of the shaft protruding outside of the duct to indicate damper position.
3. Secure fire damper to firerated structure so in case of duct collapse, damper will remain intact. Provide six spare links for each type of fire damper on project.

B. Access Doors:
1. Provide in ducts where shown and for access to automatic dampers, fire dampers, filters and all other equipment not otherwise accessible. Locate door within six inches of device served. If flexible duct or grille can be removed to access dampers or equipment, the access door is not required.
2. Install in accessible locations.
3. Provide labels on access door indicating device served. Text size shall be minimum 3/8" tall on an engraved adhesive backed label.

END OF SECTION 15910

SECTION 15 940 - AIR OUTLETS AND INLETS

1. GENERAL

1.1 Work included:
- A. Grilles & Registers

1.2 Related work:
- A. Section 15890 - Ductwork
- B. Section 15910 - Ductwork Accessories

1.3 Submittals:
- A. Provide submittals in accordance with Division 1 on:
  - 1. Grilles, Registers and Diffusers

2. PRODUCTS

2.1 Acceptable manufacturer's:
- A. Grilles, Registers, Diffusers:
  - 1. Air Guide, Anemostat, Cesco, Nailor, Price, Metalaire, Prefco, Ruskin, Titus, or Tuttle & Bailey, Krueger.

2.2 Equipment:
- A. Grilles, Registers, Diffusers:
  - 1. Manufacturer's and model numbers as specified on the drawings.

3. EXECUTION

3.1 Installation:
- A. Grilles, Registers and Louvers:
  - 1. Grilles, Registers, Diffusers shall be ceiling, wall, or duct mounted as shown on the drawings.
  - 2. Cut ceiling tiles and mount G,R&D's square and plumb.
  - 3. Provide finishes of product as selected by the Architect where indicated on the G,R&D Schedule.
  - 4. Openings to the exterior shall be covered with birdscreen.
  - 5. Caulk perimeter of louvers to provide a weathertight installation.

END OF SECTION 15940

SECTION 15 950 - CONTROLS

1. GENERAL

1.1 Work included:
- A. Electric controls and interface to the Owner's Building Automation System..

1.2 Control diagrams:
- A. Diagrams on the drawings indicate schematic configuration of control systems only.
- B. Provide accessories and auxiliary devices required (relays, switches, contacts, transformers, etc.) to operate system as specified herein and on the drawings.

2. PRODUCTS

2.1 Temperature, Humidity, Static Pressure and Air Quality Sensors and Controllers:
- A. Refer to Equipment List on drawings.
- B. Thermostats for VRF equipment to be compatible with specific equipment types and have ability to be networked to the central controller, AC Smart Deluxe. AC Smart Deluxe to have a bacnet or equal network capability to be interfaced with the Owner's central building management systems.
- C. The boiler, snowmelt controller, computer room AC units, RTU and ERV to have a microprocessor based controllers and remote temperature sensors to cycle the heating and cooling functions of the units, and have a bacnet or equal network capability to be interfaced with the Owner's central building management systems. Provide accessories as required.
- D. Microprocessor base programmable controller, with number of input and output points as required by the specific control system for control of the HVAC System. UL Listed.
  1. Digital control system, stand alone unit, fully integrated and installed as a complete system, with network communication capability over C-bus, preprogrammed application software, field installed, 24/120 VAC transformer, battery backed up RAM for data memory, FLASH memory, terminal strip connections, LED indication on front of panel for diagnostics, time of day programming, point trending. System shall be capable of generating alarms at location of operator monitoring station.
  2. Built-in timeclock with digital, 4 channel features, 365 day programming, 40 holiday dates, and 8 holiday blocks.
  3. Unit shall be capable with interfacing with portable PC laptop via modem for operator interface.
  4. The inputs to process resistive, dc voltage, mA and dry contact signal devices. Outputs to be digital or variable Vdc or to 20 mA max.
  5. The engineering, installation supervision and labor, calibration, software programming, and checkouts necessary shall be completely provided by the contractor.
  6. Contractor to provide one year monitoring of DDC control system by interfacing with controller at his business location via modem and designated phone line. Contractor to provide designated phone line for one year.
  7. Controllers are integrated into the boiler, computer room AC units, RTU and ERV units, with sensors compatible with the control system. Provide bacnet or equivalent interface device for each controller to connect with the Owner's building management system.
  8. DDC Sensors
     - a. Outside air temperature - AI, 11" duct mount probe.
     - b. Duct Air temperature - AI, 11" duct mount probe,
     - c. Room temperature - AI, wall mount box, temperature indicating scale in degrees F, 3 degree adjustment and 3 hour override timer.
     - d. Room humidity - AI, wall mount box, humidity indicating scale in % RH.
- E.. Snowmelt control to be micoprocessor controlled, surface temperature controller, automatic start with timed stop, manual start with timer, bacnet or equal communication compatible, NEMA 1 enclosure, slab sensor, snow/ice sensor with sensor socket, 24 vac type, digital output. Tekmar 654 controller with 070/094/091/073. Provide all accessories for a complete operating system.

F. Radiant slab heat controller to have digital temp. display, remote sensing bulb embedded in slab, night setback control, temp. adjustment, lock out controls, override timer, digital outputs, 24 vac. Tekmar or equal.

1.2 Damper operators:

A. Motorized dampers:

1. Refer to Equipment List on the drawings.

1.3 Control wiring:

A. Low voltage wiring shall be insulated and shielded as required by the equipment manufacturer, for the length of runs and anticipated electrical load on the wiring.

B. Route and label wiring in a neat and orderly manner.

C. Wiring run exposed in mechanical rooms and to outdoor equipment to be run in conduit.

1. Comply with requirements of Division 16 for conduit work.

2. EXECUTION

2.1 Installation (general):

A. Comply with manufacturer's instructions for installation of materials and equipment. Install components to allow service access.

B. Mount room thermostats and temperature sensors at 48 inches above finished floor.

1. Provide locking plastic cover for thermostats in public areas. Turn over keys to locking covers to Owner - keying to match Owner's building standard.

2. Do not install in area of direct sunlight or direct diffuser airflow.

C. Do not install instrumentation when areas are under construction except for required rough-ins, taps, supports and test plugs.

D. Conductor drops in finished areas shall be run concealed. - comply with requirements set forth in Division 16.

E. Install damper and valve actuators to allow proper operation. Actuators must be in the near vertical position - consult with manufacturer.

F. The location of components shown on the drawings are approximate and are subject to such revisions as may be necessary or desirable at the time work is being installed at no additional cost to the Owner.

2.2 Sequence of Control:

A. The thermostat and microprocessor controller will index the occupied or unoccupied mode of operation according to a programmable time-of-day and day-of-week schedule.

B. Occupied mode - RTU blower and ducted AHU fans to run continuously. ERV exhaust fan to run continuously in occupied modes. See below for the ERV supply fan control. . ERV exhaust duct and outside air intake motorized damper to open in occupied mode, as controlled. See below for ERV supply air duct motorized damper control. Ductless FC's to vary speed/cycle with the thermostat to maintain room comfort.

C. In the unoccupied mode, the thermostats will cycle the FC's, RTU, and AHU's blowers to maintain temperature setback control. The outside air and exhaust air dampers will remain closed unless otherwise noted. ERV to be off.

D. On call for heat by the room thermostat, the FC, RTU, AH units' blowers and heat pump compressors or gas heat will be enabled. On a call for additional heat, RTU gas heat will stage up.

E. On a call for cooling by the room thermostat, the FC and AH unit's blowers and cool compressors will be enabled and modulated. For the RTU, blower and first the 0-100% OA economizer to be enabled, and operate if outside conditions are suitable, otherwise the cool compressor to be enabled and staged.

F. Float switch to disable applicable ducted air handling units in case of water in the overflow pan.

G. The room mounted CO2 sensor to open the motorized OA damper in case of poor room carbon dioxide levels, 1000 ppm, otherwise the damper to close to the 25% open position.

H. Unit mounted (ERV and RTU) smoke detectors to disable applicable unit in case of abnormal smoke condition. Alarm annunciation by others. Space mounted smoke detectors in the IT

computer room to disable the CRAC units in case of abnormal smoke condition.

I. ERV:
   1. See above for exhaust fan operation.
   2. Supply fan to be enabled in occupied mode and the motorized OA damper to open. The variable frequency drive controller to modulate the blower speed based on duct static pressure. Several of the duct mounted motorized dampers may close as controlled by the CO2 sensor and change the duct static pressure..
   3. The discharge air temperature controller to enable the heating/cooling functions of the ERV to maintain a leaving air temp. of 68F (adjustable). The heating and cooling systems to cycle as required by the temp. sensor.
   4. The space mounted humidity sensor to enable the blower and cool compressor. If the discharge air is too cool, the hot gas reheat coil to be enabled as required.
   5. Plate heat exchanger to reclaim energy and provide fresh air during operation..

J. Boiler:
   1. Boiler and injection pumps enabled when outside temperature drops below 55F (adjustable) and the water flow thru the boiler is detected. Main pump to be enabled at 55F outdoor temperature and speed of pump controlled by a VFD drive, as controlled by the piping pressure sensor.
   2. The boiler to be set up with outside air reset, to deliver 120F at 20F outside temperature or below, and reset to 90F temp. water at 55F outside temperature. All setpoints to be adjustable.
   3. For underslab radiant heat system inside the building, the room thermostat or controller to open the control valve at the manifold to allow water flow thru the system.
   4. Snow melt in the outside sidewalks to be enabled by the sensors/controller to open the control valve at the respective manifolds. Mount the slab sensor in the east sidewalk. Mount the outside air sensor on the north side of the building.

2.3 Project closeout:

A. Prior to final completion, demonstrate operation of control system to Owner's staff and provide complete operating and maintenance documentation.

B. Provide electronic copies in .pdf format of As-Built wiring diagrams detailing high and low voltage wiring, field and factory wiring.

END OF SECTION 15950

END OF DIVISION 15

DIVISION 16

ELECTRICAL TABLE OF CONTENTS

16010 GENERAL REQUIREMENTS
16110 RACEWAYS AND FITTINGS
16120 WIRE AND CABLE
16130 BOXES
16140 WIRING DEVICES
16420 ELECTRIC SERVICE
16425 SWITCHBOARD
16440 DISCONNECT SWITCHES
16450 GROUNDING
16470 PANELBOARDS
16475 FUSES
16480 MOTOR CONTROLLERS
16490 AUTOMATIC TRANSFER SWITCH
16501 LAMPS
16502 BALLASTS AND ACCESSORIES
16510 INDOOR LIGHTING FIXTURES
16520 OUTDOOR LIGHTING FIXTURES
16535 EMERGENCY LIGHTING FIXTURES
16620 EMERGENCY GENERATOR
16670 LIGHTNING PROTECTION SYSTEM
16721 FIRE ALARM SYSTEM
16730 CONDUIT AND CABLE TRAY
16740 IT SYSTEM
16770 SECURITY SYSTEM

END OF TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16010 - GENERAL REQUIREMENTS

1. **GENERAL**

1.1 WORK INCLUDED
- A. Electrical Lighting and Power
- B. Fire Alarm
- C. Conduit Systems
- D. IT System
- E. Security System
- F. Lightning Protection

1.2 RELATED WORK
- A. Requirements of: "General Conditions for the Contract" and "Division 1".
- B. Other divisions as relates to: products installed but not furnished by this Division, or products furnished but not installed by this Division.
- C. Other divisions as relates to: coordination of work.

1.3 CODES AND STANDARDS
- A. Comply with: Virginia Uniform Statewide Building Code and the National Fire Codes.
- B. Meet or exceed recommendations of: IEEE, IES, NEMA and UL.

1.4 SHOP DRAWINGS AND PRODUCT DATA
- A. Submit in accordance with Division 1 for the following. Refer to individual sections for additional requirements.
  1. Section 16140 - Wiring Devices
  2. Section 16425 - Switchboard
  3. Section 16440 - Disconnect Switches
  4. Section 16470 - Panelboards
  5. Section 16475 - Fuses
  6. Section 16480 - Motor Controllers
  7. Section 16490 - Transfer Switches
  8. Section 16501 - Lamps
  9. Section 16502 - Ballasts and Accessories
  10. Section 16510 - Indoor Lighting Fixtures
  11. Section 16520 - Outdoor Lighting Fixtures
  12. Section 16535 - Emergency Lighting Fixtures
  13. Section 16620 - Emergency Generator
  14. Section 16670 - Lightning Protection
  15. Section 16721 - Fire Alarm System
  16. Section 16730 - Cable Tray
  17. Section 16740 - IT System

18. Section 16770 - Security System
19. Drawings - Electric Heaters, Lighting Controls, Atrium Sound System

1.5 WARRANTIES

A. In addition to guarantee specified in the General Conditions, refer to individual sections for additional requirements.

1.6 PROJECT RECORD DRAWINGS

A. Provide as required by Division 1.

1.7 OPERATING AND MAINTENANCE MANUALS

A. Provide in accordance with Division 1 for the following.
   1. Section 16140 - Wiring Devices
   2. Section 16425 - Switchboard
   3. Section 16440 - Disconnect Switches
   4. Section 16470 - Panelboards
   5. Section 16475 - Fuses
   6. Section 16480 - Motor Controllers
   7. Section 16490 - Transfer Switches
   8. Section 16501 - Lamps
   9. Section 16502 - Ballasts and Accessories
   10. Section 16510 - Indoor Lighting Fixtures
   11. Section 16520 - Outdoor Lighting Fixtures
   12. Section 16535 - Emergency Lighting Fixtures
   13. Section 16620 - Emergency Generator
   14. Section 16670 - Lightning Protection
   15. Section 16721 - Fire Alarm System
   16. Section 16730 - Cable Tray
   17. Section 16740 - IT System
   18. Section 16770 - Security System
   19. Drawings - Electric Heaters, Lighting Controls, Atrium Sound System

B. Data shall include catalog sheets, assembly details, dimensional drawings, operating and maintenance instructions, manufacturer's name and name of local supplier.

2. PRODUCTS

2.1 PRODUCTS

A. Provide new materials and equipment unless otherwise noted. Furnish (including freight and unloading) and install unless otherwise noted.

2.2 SUBSTITUTIONS

A. Equipment provided for this project shall be equivalent to products specified herein and on the drawings. Equivalent equipment by alternate manufacturers listed, may be substituted for the particular

model specified, however Contractor shall guarantee equivalence and is responsible for modifications required and coordination with other divisions to fit substituted product into the project.

B. Substitutions of equipment by a manufacturer not listed as an alternate, will be allowed only if written approval is obtained 10 days prior to bidding. Bidding contractors must make a written request to the Architect for approval of a substitution, at least 17 days prior to bidding date. Written request shall include pertinent data on the equipment required to evaluate it's equivalence.

3. EXECUTION

3.1 EXECUTION

A. Notify Architect immediately of conflicts and deficiencies. Do not proceed until unsatisfactory conditions have been resolved.

B. Repair damaged and defective equipment and materials. Replace items that cannot be properly repaired. Clean exposed and semi-exposed surfaces of equipment and materials. Touch-up shop-applied finishes to restore damaged and soiled areas.

3.2 DRAWINGS

A. Electrical drawings show general arrangement and routing of equipment. Follow as closely as possible in actual building construction while coordinating with other trades.

B. Consider Architectural, Structural and Mechanical drawings a part of this work as these drawings furnish information relating to design and construction of the project.

C. In case of conflict between Specifications and Drawings, consult Architect immediately for determination of how to proceed.

3.3 TRAINING

A. Instruct Owner's representative in operation and maintenance of electrical systems utilizing Operation and Maintenance Manual.

B. Instruction period shall occur after substantial completion of electrical systems and prior to completion of the project. Coordinate with the Architect and the Owner.

3.4 DEMOLITION

A. Remove existing work as indicated or as required to clear areas of new construction. Equipment that is not being reused shall become the property of the Contractor and shall be removed from the site. Existing electrical work which is disturbed by work under this Contract shall be restored to its condition prior to the disruption. Remove wiring, equipment and devices completely. Remove conduit and boxes where exposed, abandon where concealed. Provide blank coverplates for abandoned boxes as required.

B. Use extreme care in relocating existing equipment and materials to prevent damage during the removal and reinstallation. Clean and provide touch-up paint (if required) before installing at new location. When damage occurs, repair or replace materials or equipment as directed by the Architect. If equipment or materials indicated to be relocated exist in a damaged or unusable condition, immediately notify the Architect for determination of how to proceed.

C. Demolition will be phased, closely coordinate efforts with the schedule. The existing Municipal Building will remain and experience minor demolition and new electrical work as shown on the plans. The Annex Building will be demolished in phases. All utilities to both of the existing buildings are to remain in full service at all times during the construction, coordinate any work required with the respective utility companies. Maintain and provide any protection required at the Annex Building electric service when walls are opened up until the time of total demolition.

D. There will be a temporary underground conduit provided to the Annex Building from the existing Municipal Building, see site plan. Provide new cables and reconnect each end to provide full services to the Annex Building in strict accordance with the requirements of the City's IT personnel. This is for Council Chamber's TV broadcasting and IT cables.

E. Coordinate with relocation schedule for the Council Chambers equipment and casework, all rough-in shall be in place in new room prior to this relocation. Reinstall and reconnect as required for full operation as it exists presently.

END OF SECTION 16010

SECTION 16110 - RACEWAYS & FITTINGS

1. GENERAL

1.1 WORK INCLUDED

A. Conduits
B. Fittings

1.2 RELATED WORK

A. Division 2 - Excavation and Backfilling
B. Section 16120 - Wire and Cable
C. Section 16130 - Boxes
D. Section 16730 - Conduit Systems

2. PRODUCTS

2.1 CONDUITS

A. Conduit sizes shall be as required by the National Electrical Code (unless indicated or specified otherwise) for the number and size of wire indicated. Minimum size conduit shall be ½ inch electrical trade size. Flexible metal conduit used for lighting fixture whips may be 3/8" where allowed by code.
   1. Electric metallic tubing: thin wall, hot-dipped galvanized, applicable specifications WW-563/ANSI C33.98/ANSI C80.3/UL 797/CSA C22.2 No. 83.
   2. Rigid nonmetallic conduit: heavy wall, schedule 40 PVC, applicable specifications WC-1094A/UL651.
   3. Flexible metal conduit: steel, applicable specifications UL1/WWC-C-566/CSA 22.2 No. 56.
   4. Liquidtight flexible metal conduit: steel with a thermoplastic jacket, applicable specifications UL360/CSA C22.2 No. 56.

2.2 FITTINGS

A. Electric metallic tubing:
   1. Dry locations: set screw, all steel, zinc plated with nylon insulated throat.
B. Rigid nonmetallic conduit: schedule 40 solvent cement type.
C. Flexible metal conduit: steel/malleable iron, zinc plated, angled saddle or squeeze type with anti short bushings.
D. Liquidtight flexible metal conduit: compression type, steel/malleable iron, zinc plated with nylon insulated throat and taper threaded hubs.

2.3 CONDUIT INSTALLATION

A. Use electric metallic tubing except as follows:
   1. Use rigid nonmetallic conduit in or under on grade concrete slabs.
   2. Use flexible metal conduit for motor and equipment connections in dry locations. Length shall be as short as possible and shall not exceed six feet.
   3. Branch circuit wiring above suspended ceilings, in stud partitions or in furred spaces may be metal clad cable (MC) as permitted by the National Electrical Code. Refer to Section 16120.

B. Install conduits concealed in walls, ceilings or floors unless indicated or specified otherwise. Conduits may be installed exposed in unfinished areas (ie: equipment rooms).

C. Install exposed conduits in runs parallel or perpendicular to walls structural members, or intersections of vertical planes or ceilings. Exposed and concealed conduits shall pass through walls, floors or ceilings at right angles.

D. Insure that conduits are in alignment between bends, elbows and terminations; that bends are free of crimps, that joints and terminations are tight and secure; that interiors are smooth and free of burrs and foreign objects; and that interiors are full size entire length.

E. During construction, close ends of conduits with metal or plastic caps intended for the purpose.

F. Field bending of conduits and tubing shall be made with hand or powered equipment approved for the purpose. Use of torches to bend nonmetallic conduit is not approved. Radius of bends shall be as per the National Electrical Code for type of conduit and tubing used.

G. Conduits passing through a fire rated wall or floor shall not lessen the rating of the structure through which they pass.

H. Final installation of conduits penetrating waterproof construction shall be completely watertight.

I. Plumbing work takes precedent in chase walls, do not run any wiring in plumbing walls until piping is complete.

2.4 SLEEVES

A. Sleeve conduits passing through concrete floor slabs and concrete, masonry, tile and gypsum walls as follows:
   1. Locate and install sleeves as floors and walls are being built, not after erection.
   2. Sleeves for concrete floor slabs - 24 gauge sheet steel with lock seam joint. Terminate flush with floor.
   3. Sleeves for walls - galvanized steel pipe unless otherwise noted, protruding from surface no more than 1/4 inch.
   4. Provide escutcheon for conduits passing through wall or floors in finished areas.
   5. Do not provide sleeves for conduits imbedded in concrete or through concrete slabs on grade.

2.5 SUPPORTS

A. Conduit shall be supported directly from the structure at intervals required by the National Electrical Code as follows:
   1. Use standard conduit hangers, one hole snap straps, thin wall conduit clamps, malleable iron pipe straps, strut channel, beam clamps, U-bolts and all-thread rods.
   2. Do not use wire ties, stab-on clips or perforated strap iron.
   3. Do not support from ceiling assembly or drywall.
   4. Securely attach supports to the structure by means of wood screws on wood, toggle bolts on hollow masonry units, bolts and expansion shields on concrete or brick and machine screws or welded threaded studs on steel.

END OF SECTION 16110

SECTION 16120 - WIRE AND CABLE

1. GENERAL

1.1 WORK INCLUDED
A. Wire
B. Cable

1.2 RELATED WORK
A. Division 15 - Control Wiring
B. Section 16110 - Raceways and Fittings

2. PRODUCTS

2.1 CONDUCTORS
A. Copper, minimum size No. 12 AWG. Other wire sizes shall be as indicated on the drawings or required by the National Electrical Code whichever is larger.
B. Conductors No. 10 and smaller shall be solid, Conductors No. 8 and larger shall be stranded.

2.2 CONDUCTOR INSULATION
A. 600 volt, type THHN THWN (90 deg C).

2.3 CABLE
A. Metal Clad Cable (MC) - 600 volt, 90 deg C with steel or aluminum interlocked armor and green insulated grounding conductor.

2.4 SPLICES AND TAPS
A. Conductors No. 10 and smaller - steel spring wire connector with thermoplastic shell.
B. Conductors No.8 and larger - mechanical type, tap connectors with insulated covers or split bolts taped to conductor insulation value.

3. EXECUTION

3.1 CONDUCTOR INSTALLATION

A. Install conductors in raceway unless otherwise indicated.
B. Pulling conductors:
   1. Do not pull conductors until raceway system is complete and boxes are free of foreign materials and moisture.
   2. Do not use heavy mechanical means to pull conductors. Wire pulling lubricant used shall be approved for use with conductor insulation type.
C. Conductors shall be continuous from point of origin to panel or equipment termination without running splices in intermediate boxes.
D. Conductors of different voltages shall not be pulled into same raceway.
E. Do not share neutrals on 120 volt branch circuits, pull separate neutral with each circuit.
F. Color code conductors as follows:
   1. Black - Phase A
   2. Red - Phase B
   3. Blue - Phase C
   4. White - Neutral
   5. Green or Bare - Ground

3.2 CABLE INSTALLATION

A. Cable shall be supported directly from the structure with staples or one-hole snap straps and intervals required by the National Electrical Code. Bored holes shall not exceed 1" diameter and shall be a minimum of 2'-0" from structural bearing points, notching of structural members is prohibited.
B. Guard strips shall be provided on each side of cable where run across top of structure in accessible attics or ceiling spaces. Strips shall be at least as high as cable.
C. MC Cable shall be routed as straight with structure and as neatly as possible, “spider web” type routing of cables to find the shortest distance possible will be reworked or replaced at the discretion of the Engineer.

END OF SECTION 16120

SECTION 16130 - BOXES

1. GENERAL

1.1 WORK INCLUDED

A. Outlet and Junction Boxes
B. Pull Boxes
C. Wireway
D. Floor Outlets

1.2 RELATED WORK

A. Section 16110 - Raceways and Fittings
B. Section 16120 - Wire and Cable
C. Section 16140 - Wiring Devices
D. Section 16730 - Conduit System

2. PRODUCTS

2.1 OUTLET AND JUNCTION BOXES

A. Galvanized sheet steel type.
B. Single device box shall be "non-gangable" type and for multiple devices "gangable" type shall be used.
C. Boxes for exposed work shall be 4" square type. Boxes for exposed work in wet locations shall be die cast type with threaded hubs.
D. Sectional boxes shall not be used in masonry or concrete.
E. Boxes for use with non-metallic sheathed cable shall be plastic of fiberglass type.
F. Sized for number of conductors, fittings and devices as required by the National Electrical Code.

2.2 PULL BOXES AND WIREWAYS

A. Indoor NEMA 1 - galvanized sheet steel, screw cover type.
B. Outdoor NEMA 3R - galvanized sheet steel, screw cover type with top mounted drip shield and seamless sides.
C. Size for number and size of conduit entries and type of pull as required by the National Electrical Code.

2.3 FLOOR OUTLETS

A. In concrete pour:
   1. Wiremold fully adjustable Omnibox 880, one, two or three gang as specified on the drawings. Duplex cover shall be 828R flip lid type and data/phone cover shall be 828COMTC communication plate.
   2. Coverplates and trim suitable for finished floor surface.

B. Alternate manufacturers:
   1. Carlon
   2. Hubbell
   3. Steel City
   4. Thomas and Betts

3. EXECUTION

3.1 INSTALLATION

A. Secure boxes to structure by means of screws, bolts, rod hangers or other approved means. Raceways entering or leaving box shall not be used for support.

B. Boxes shall be level and plumb. Boxes for flush equipment shall be placed to within 1/4" of the finished surface, provide extensions or plaster rings as required.

C. Junction and pull boxes shall be installed readily accessible, unobstructed by piping, ducts or other equipment.

D. Boxes shall be mounted at height indicated on the drawings or directly adjacent to piece of equipment served.

E. Seal spare or unused openings in boxes with approved fittings.

F. Do not place floor boxes until exact spacings and locations are identified by the Architect.

G. For boxes installed in wet locations provide clear silicone caulk between box and surrounding surface to prevent water entry.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

1. GENERAL

1.1 WORK INCLUDED

A. Wiring Devices
B. Coverplates

1.2 RELATED WORK

A. Section 16130 - Boxes
B. Section 16740 - Empty Conduit System

2. PRODUCTS

2.1 WIRING DEVICES

A. Single pole wall switch - P&S No. 20AC1
B. Three way wall switch - P&S No. 20AC3
C. Four way wall switch - P&S No. 20AC4
D. General purpose duplex receptacle - P&S No. 5362
E. Ground fault circuit interrupter - P&S No. 2091-S
G. Refer to drawings for specification of additional devices, devices not specified shall be of the same manufacturer and specification quality as those listed above. Device color to match coverplates specified.

2.2 COVERPLATES

A. Interior recessed - smooth unbreakable high-impact thermoplastic, ivory color for light finishes and brown for dark finishes or as directed by the Architect: P&S P-Line RP series
B. Interior surface - 4" square raised cover, galvanized

2.3 ALTERNATE MANUFACTURERS

A. Cooper
B. Hubbell
C. Mulberry
D. Leviton

3. EXECUTION

3.1 INSTALLATION

A. Install devices approximately at the locations indicated on the drawings. Determine exact location by conditions of construction. Coordinate locations to avoid conflict with other equipment being installed. Install devices straight and solid to box. Coordinate placement of boxes in and around knee spaces, counter tops, built-in casework and the like to avoid conflicts with mirrors and other items, switches shall be to strike side of door. Refer to Architectural drawings.

B. Mounting heights of wall outlets shall be as indicated on the drawings and shall be measured from the finished floor to the center of the outlet.

C. Where devices are shown grouped together, provide a single, multiple gang plate. Dimmer switches specified require additional boxes for ganging and are not suitable for ganging with switches, verify requirements prior to rough-in.

D. Where GFI outlets are used to provide feed-thru protection, do not feed-thru across partitions, provide a separate device.

END OF SECTION 16140

SECTION 16420 - ELECTRIC SERVICE

1. GENERAL

1.1 WORK INCLUDED

A. Underground Electric Service

1.2 RELATED WORK

A. Section 16110 - Raceways and Fittings
B. Section 16120 - Wire and Cable
C. Section 16130 - Boxes
D. Section 16425 - Switchboard

2. PRODUCTS

2.1 PRODUCTS

A. Refer to the appropriate Section of this Division of the Specification for the requirements for the various components of the electric service (ie: Section 16440 for disconnect switches).
B. Service shall be 120/208 volt, 3 phase, 4 wire.

3. EXECUTION

3.1 INSTALLATION

A. Provide labor and materials not furnished by the power company.
B. Do work regarding the electrical service and its equipment in accordance with the requirements of the power company. If the Contract Documents indicate work that is to exceed these requirements, follow the Contract Documents.
C. Label equipment for the electric service in accordance with the appropriate section of this Division. Main switches or breakers are to be identified as such in addition to identifying the item fed.

3.2 SEQUENCING AND SCHEDULING

A. Notify the power company of the timing requirements for the project and arrange for metering equipment, connections and service.

END OF SECTION 16420

SECTION 16425 - SWITCHBOARD

1. GENERAL

1.1 WORK INCLUDED
A. Switchboard

1.2 RELATED WORK
A. Section 16470 - Panelboards

2. PRODUCTS

2.1 SWITCHBOARD
A. Totally enclosed, dead front, free-standing, front and rear aligned, front accessibility only. Framework shall be UL gauge steel with NEMA Type 1 construction and provided with corrosion-resistant paint.
B. The short circuit current rating shall not be less than 65,000 RMS symmetrical amps. The short circuit current rating of branch circuit devices shall be determined by UL labeled series connected ratings.
C. 120/208 volt, 3 phase, 4 wire. Through-bus shall be 2000 ampere with sufficient cross sectional area to meet UL standards for temperature rise. Through-bus and neutral bus shall be 100% rated, ground buss shall be sized as per UL standard 891. Distribution section bus shall be 2000 ampere. All bussing shall be tin-plated copper.
D. Main disconnect devices shall be circuit breakers. In conjunction with the main devices provide customer metering module and SPD as per details on the drawings.

2.2 MANUFACTURERS
A. Same manufacturer as the panelboards.

3. EXECUTION

3.1 INSTALLATION
A. Assemble switchboard sections and provide proper torque on connections as recommended by the manufacturer.
B. Provide 4" concrete pad for switchboard.
C. Provide nameplates with circuit designations neatly typed. Notations shall indicate the nature and location of loads served by each circuit.

END OF SECTION 16425

SECTION 16440 - DISCONNECT SWITCHES

1. GENERAL

1.1 WORK INCLUDED
- A. Non-fused Safety Switches
- B. Fused Safety Switches
- C.

1.2 RELATED WORK
- A. Section 16470 - Panelboards
- B. Section 16475 - Fuses

2. PRODUCTS

2.1 SAFETY SWITCHES
- A. General:
  1. Same manufacturer as the panelboards, refer to Section 16470.
  2. NEMA 1 for indoor use, NEMA 3R for outdoor use.
- B. Non-fused safety switches:
  1. Single phase and 60 ampere or less rated
     - a. Deadfront pullout type, clam shell design.
  2. Three phase and single phase rated more than 60 ampere:
     - a. Visible blade type with external operating handle and cover interlock and pad locking provisions.
- C. Fused safety switches:
  1. Visible blade type with external operating handle and cover interlock and pad locking provisions.
  2. Suitable for use with fuses specified and equipped with rejection devices where required by the National Electrical Code.
  3. Motor circuit switches:
     - a. Horsepower rated.
  4. Others:
     - a. General duty.

3. EXECUTION

3.1 INSTALLATION
- A. Mount switches on wall or at associated piece of equipment. Wall mounted switches shall be 48 inches above finished floor.
- B. Provide engraved plastic laminate nameplate for each disconnect switch located on front outside cover, nameplate shall indicate item served.

END OF SECTION 16440

SECTION 16450 - GROUNDING

1. GENERAL

1.1 WORK INCLUDED
- A. Grounding Electrode System
- B. Equipment Grounding

1.2 RELATED WORK
1. Section 16140 - Wiring Devices
2. Section 16425 - Switchboard
3. Section 16470 - Panelboards

2. PRODUCTS

2.1 COMPONENTS
- A. Connections to building steel shall be made with bronze or brass bolted type fittings designed for the use.

3. EXECUTION

3.1 INSTALLATION
- A. Grounding electrode system:
  1. Size as indicated on the drawings.
  2. As described in article 250 of the National Electrical Code.
- B. Equipment grounding:
  1. Pull ground conductors in all conduits. Size equipment grounding conductors as per table 250-95 of the National Electrical Code.

END OF SECTION 16450

SECTION 16470 - PANELBOARDS

1. GENERAL

1.1 WORK INCLUDED

A. Panelboards
B. Circuit Breakers

1.2 RELATED WORK

A. Section 16110 - Raceways and Fittings
B. Section 16425 - Switchboard
C. Section 16440 - Disconnect Switches
D. Section 16450 - Grounding
E. Section 16480 - Motor Controllers

2. PRODUCTS

2.1 PANELBOARDS

A. General:
   1. Panelboards provided shall be by one manufacturer.
   2. Factory made and assembled.
   3. Copper bus bars.
   4. Minimum 20" wide cabinets with doors.
   5. Provided with directory card, frame and transparent cover.
   6. Flush mounted cylinder type locks, keyed alike with 2 keys for each panelboard.
   7. Panelboards shall be as scheduled on the drawings and as specified herein or the equivalent by:
      a. Cutler Hammer
      b. General Electric
      c. Siemens

2.2 CIRCUIT BREAKERS

A. Thermal-magnetic.
B. Molded case.
C. Bolt-on type.
D. Provide series connected short circuit rating of 65,000 AIC using breakers in a combination which allows some breakers to have lower individual interrupting ratings than the available fault current. These combinations are to be UL tested and certified.

3. EXECUTION

3.1 INSTALLATION

A. Flush or surface mount as indicated on the drawings.

B. Neatly type circuit designations on directory card. Notations shall indicate the nature and location of loads served.

C Provide engraved laminate nameplate for each panel located on outside of door, nameplate shall include panel designation on the drawings, service voltage and phase.

END OF SECTION 16470

SECTION 16475 - FUSES

1. GENERAL

1.1 WORK INCLUDED
A. Branch Circuit Fuses

1.2 RELATED WORK
A. Section 16440 - Disconnect Switches
B. Section 16480 - Motor Controllers

2. PRODUCTS

2.1 BRANCH CIRCUIT FUSES
A. Time-delay, dual-element.
B. Current limiting.
C. Class RK-5.
D. Interrupting rating of 200,000 RMS amperes
E. Type and ampere rating as indicated on the drawings.

2.2 MANUFACTURERS
A. Littelfuse
B. Bussman
C. Shawmut
D. Edison

3. EXECUTION

3.1 INSTALLATION
A. Fuses shall be of the size and voltage listed on the drawings, however, contractor should note that characteristics may change due to changes in equipment supplied. If actual characteristics are different than specified, contractor shall provide proper fuses.

END OF SECTION 16475

SECTION 16480 - MOTOR CONTROLLERS

1. GENERAL

1.1 WORK INCLUDED

A. Motor Controllers
B. Combination Motor Controller / Disconnect Switch

1.2 RELATED WORK

A. Division 15 - Motor Specification
B. Section 16110 - Raceways and Fittings
C. Section 16120 - Wire and Cable

2. PRODUCTS

2.1 MOTOR CONTROLLERS

A. Full voltage, non-reversing magnetic type rated in accordance with NEMA standards, sizes and horsepowers.
B. Controllers shall include:
   1. Hand-Off-Auto switch.
   2. External reset melting alloy overload relays.
   3. Double break silver alloy contacts.
   4. Normally open holding circuit contact.
   5. (2) normally open auxilliary contacts.
   6. Cover mounted red "RUN" pilot light.
   7. Individual control transformer with fusing as required.
   8. Phase failure/reversal relay.
   9. NEMA 1 for indoor use, NEMA 3R for outdoor use.
   10. Same manufacturer as the panelboards.

2.2 COMBINATION CONTROLLER / DISCONNECT SWITCH

A. Motor controller and disconnect switch in same enclosure.
   1. Refer to paragraph 2.1 above for controller specification.
   2. Disconnect switch shall be a motor guard type circuit breaker.

3. EXECUTION

3.1 INSTALLATION

A. Mount controllers on wall or at associated piece of equipment. Wall mounted controllers shall be 48" above finished floor.

B. Provide engraved laminate nameplate for each controller located on front outside cover, nameplate shall indicate item served.

C. Size overload units based on nameplate full load current of actual motor installed. Controllers shall be the size and voltage listed on the drawings, however, contractor should note that motor characteristics may change due to changes in equipment supplied. If actual characteristics are different than specified, contractor shall provide proper controller.

D. Connections to motors shall be made with flexible conduit, refer to Section 16110.

END OF SECTION 16480

SECTION 16490 - AUTOMATIC TRANSFER SWITCH

1. GENERAL

1.1 WORK INCLUDED

A. Utility to Generator Set Automatic Transfer Switch

1.2 RELATED WORK

A. Section 16450 - Grounding
B. Section 16620 - Emergency Generator

2. PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. UL Listed as per Standard 1008.
B. Continuous current rating as shown on plans, 3 pole, 4 wire, solid neutral, 120/208 volts with a withstand rating of 65,000 amps RMS.
C. Control by mechanically held NEMA type contactor and electrically operated single solenoid.
D. Key lockable NEMA 1 enclosure with the following front panel devices:
   1. Normal-Emergency switch position indicator lights.
   2. Normal Source-Emergency Source availability lights.
   3. Test-Normal-Retransfer key operated selector switch.
E. Mechanism shall have the following:
   1. Friction-free, constant force, straight-line action.
   2. Independent break-before-make action.
   3. Mechanical interlock to prevent simultaneous closing of normal and emergency contacts.
   4. Electrical interlock to prevent simultaneous closing signals to normal and emergency contacts and interconnection of normal and emergency sources through the control wiring.
   5. 600 VAC, high pressure, silver alloy type main contacts.
   6. Multiple leaf arc chutes to coil and quench arcs.
   7. 250 VAC, 10A continuous rated auxiliary contacts (one for each source) pre-wired to terminal block.
   8. Manual operators.
   9. Gold type dry contacts for engine control.

F. Electronic control shall include the following:
   1. 0 to 15 second start delay.
   2. 2 to 120 second transfer delay.
   3. 0 to 30 minute retransfer delay.
   4. 0 to 10 minute stop delay.
   5. Adjustable voltage sensors as follows:
      a. Pickup: 85% to 98% of normal voltage.
      b. Dropout: 75% to 98% of pickup setting.
      c. Dropout time delay: 0.5 seconds fixed.

G. LED status indicators as follows:
   1. Source 1 OK.
   2. Source 2 OK.
   3. Genset Start Signal.
   4. Transfer Timing.
   5. Transfer Complete.
   6. Retransfer Timing.
   7. Retransfer Complete.
   8. Timing For Stop.

H. Include the following accessories:
   1. Adjustable overvoltage and frequency sensors with dropout time delays on emergency side.
   2. In phase monitor for reliable switching of motors and other inductive loads.
   3. 10 amp, 12 volt float type battery charger.
   4. 24 volt auxiliary relay with 2 NO and 2 NC, 600 VAC, 6A rated contacts (one for each source).

I. Kohler model KCS or the equivalent by:
   1. Cat
   2. Onan
   3. MTU
   4. Detroit Diesel

3. EXECUTION

3.1 INSTALLATION

A. Install automatic transfer switch and accessories in accordance with the manufacturer's requirements.

B. Program transfer switches for emergency and standby transfer times per code.

3.2 START-UP AND TESTING

A. Initial start-up shall be performed by a factory-trained representative of the automatic transfer switch manufacturer.

END OF SECTION 16490

SECTION 16501 - LAMPS

1. GENERAL

1.1 WORK INCLUDED

A. Lamps for equipment furnished under this Division.

1.2 RELATED WORK

A. Section 16510 - Indoor Lighting Fixtures
B. Section 16520 - Outdoor Lighting Fixtures

2. PRODUCTS

2.1 LAMPS

A. Number, size and type of lamps shall be as specified in Section 16510, Section 16520 and as follows:
   1. T5 type fluorescent lamps, 3500K with 84 CRI minimum.
   2. Metal Halide Lamps - universal burning position, clear type.
   3. Other lamps shall be as specified on the drawings.

2.2 ACCEPTABLE MANUFACTURERS

A. General Electric
B. Philips
C. Sylvania
D. Ushio

3. EXECUTION

3.1 INSTALLATION

A. Permanent lamps shall not be used as temporary lighting during construction, if fixtures are to be used, temporary lamps shall be provided and permanent lamps shall not be installed until time of Owner's acceptance of building.

END OF SECTION 16501

SECTION 16502 - BALLASTS & ACCESSORIES

1. GENERAL

1.1 WORK INCLUDED

A. Ballasts for lighting fixtures
B. Lighting fixture accessories

1.2 RELATED WORK

A. Section 16510 - Indoor Lighting Fixtures
B. Section 16520 - Outdoor Lighting Fixtures

2. PRODUCTS

2.1 FLUORESCENT BALLASTS

A. Electronic programmed/rapid start type with equal to or less than 10% total harmonic distortion, 2 year warranty.
B. Class P, Non-PCB, category A, voltage to match system voltage.
C. Meet or exceed current federal efficacy standards, FCC rules and regulations and ANSI requirements.

2.2 HID BALLASTS

A. HPF, constant wattage autotransformer (CWA).
B. Encased and potted.

2.3 ACCEPTABLE MANUFACTURERS

A. Advance
B. Universal
C. Sylvania
D. GE
E. Keystone

2.4 ACCESSORIES

A. Including but not limited to the following for a complete lighting fixture installation:
   1. Plaster frames.
   2. Tee bar hangers.
   3. Hold down clips for suspended ceilings.

3. EXECUTION

3.1 INSTALLATION

A. Unless indicated otherwise ballasts shall be factory installed and wired.

B. Install accessory equipment, not factory installed, as recommended by the manufacturer and as required by the National Electrical Code.

END OF SECTION 16502

SECTION 16510 - INDOOR LIGHTING FIXTURES

1. GENERAL

1.1 WORK INCLUDED
- A. Indoor Lighting Fixtures

1.2 RELATED WORK
- A. Section 16501 - Lamps
- B. Section 16502 - Ballasts and Accessories
- C. Section 16520 - Outdoor Lighting Fixtures
- D. Section 16535 - Emergency Lighting Fixtures

2. PRODUCTS

2.1 LIGHTING FIXTURES
- A. Scheduled on the drawings.

3. EXECUTION

3.1 INSTALLATION
- A. Installation of fixtures shall be in a neat, workmanlike manner. Provide straps, supports, hangers and other materials required for proper installation.
- B. Surface mounted fixtures shall not have gaps between the fixture and attaching surface unless mounting is designed to hold fixture off ceiling, or except where required by code regulation. Continuous rows of fixtures shall be installed so as to provide perfect alignment.
- C. Support surface mounted fixtures directly from the building structure and not from the ceiling grid system. Use all-thread rods, beam clamps, pipe clamps and pipe or perforated steel channel for support. Wire ties and stab-on clips will not be accepted. The support assembly shall be capable of supporting 150 pounds in addition to the fixture weight indefinitely.
- D. Recessed fixtures shall not have gaps between the fixture trim and adjacent surface. Where light leaks occur, suitable gaskets shall be installed.
- E. Recessed lighting fixtures installed in modular or integrated ceilings shall be of the proper type for the type of ceiling being installed. Verifying type of ceiling construction prior to ordering of fixtures. Lighting fixtures shall be supported by the ceiling grid system. Additional ceiling ties shall be installed at each corner of the lighting fixture to reinforce the ceiling system.

END OF SECTION 16510

SECTION 16520 - OUTDOOR LIGHTING FIXTURES

1. GENERAL

1.1 WORK INCLUDED
- A. Outdoor Lighting Fixtures
- B. Control

1.2 RELATED WORK
- A. Section 16110 - Raceways and Fittings
- B. Section 16501 - Lamps
- C. Section 16502 - Ballasts and Accessories

2. PRODUCTS

2.1 LIGHTING FIXTURES
- A. Scheduled on the drawings.

2.3 CONTROLS
- A. Exterior Lighting Control Panel:
  - 1. Specified on the drawings or equal by Watt-Stopper or ILC.

3. EXECUTION

3.1 LIGHTING FIXTURE INSTALLATION
- A. Refer to Section 16510 for installation of fixtures attached to the building. Caulk around exterior lights and the surrounding exterior wall surface.
- B. Provide concrete bases where required and as shown on the plans.

3.2 CONTROL INSTALLATION
- A. Program exterior lighting control panel to the satisfaction of the Owner and provide hands-on training to the Owner's designated representative.

END OF SECTION 16520

SECTION 16535 - EMERGENCY LIGHTING FIXTURES

1. GENERAL

1.1 WORK INCLUDED
- A. Emergency Lighting Fixtures
- B. Exit Lighting Fixtures

1.2 RELATED WORK
- A. Section 16510 - Indoor Lighting Fixtures
- B. Section 16520 - Outdoor Lighting Fixtures

2. PRODUCTS

2.1 EXIT/EMERGENCY LIGHTING FIXTURES
- A. Scheduled on the drawings.

3. EXECUTION

2.2 INSTALLATION
- A. Emergency lighting circuits shall be switched or unswitched as shown on the plans.

END OF SECTION 16535

SECTION 16620 - EMERGENCY GENERATOR

1. GENERAL

1.1 WORK INCLUDED
- A. Emergency Generator

1.2 RELATED WORK
- A. Division 3 - Concrete
- B. Section 16490 - Automatic Transfer Switch
- C. Section 16535 - Emergency Lighting Fixtures

2. PRODUCTS

2.1 EMERGENCY GENERATOR

A. Rated for 600 KW / 750 KVA, 2082 A at 130 degree C Rise standby rating, 60 HZ., 3 phase, 4 wire, 120/208 volts.

B. Engine shall be stationary, liquid cooled, diesel fired with the following:
1. 12 volt, solenoid shift electric starter.
2. Positive displacement oil pump, replaceable oil filter elements, pressure relief valve, dipstick and oil drain valve with extension hose.
3. Replaceable heavy duty air cleaner.
4. Mechanical governing system to control system frequency.
5. Thermostatically controlled jacket heater.
6. Engine starter battery charging alternator and solid state voltage regulator.
7. Engine mounted radiator with belt driven fan, coolant pump and thermostatic temperature control.
8. Exhaust muffler with critical silencer and flexible connectors.
9. Manual reset exciter field circuit breaker.
10. Battery rack with 12 volt starting batteries, cables and connectors. Alternator strip heater.
11. Engine mounted vibration isolators.
12. Outdoor protective housing with removable side panels and hinged door for instrument panel access. Sound attenuated enclosure, 75DBA at 23'-0" under 100% load.
13. Incoming mainline circuit disconnect switches, emergency and standby as shown on plans.
14. Double-wall, subbase 24 hour fuel tank.

C. Engine mounted control panel with vibration isolation and the following:
   1. Run-Stop-Remote switch.
   2. 12 volt, 2 wire remote starting contacts.
   3. Field circuit breaker.
   4. Coolant temperature gauge.
   5. DC voltmeter.
   6. Oil pressure gauge.
   7. Running time meter.
   8. Fault reset switch.
   9. Cycle cranking.
   10. 7-light engine monitor with lamp test switch including:
      a. Run.
      b. Pre-warning for low oil pressure.
      c. Pre-warning for high coolant temperature.
      d. Low oil pressure shutdown.
      e. High coolant temperature shutdown.
      f. Overcrank shutdown.
      g. Overspeed shutdown.
   11. AC meter package including:
      a. Ammeter.
      b. Voltmeter.
      c. Frequency meter.
      d. Phase selector switch.
      e. 5% adjustable voltage rheostat.

D. Kohler model 600REOZVB or the equivalent by:
   1. Cat
   2. Onan
   3. MTU
   4. Detroit Diesel

2.2 REMOTE ANNUNCIATOR

A. Audio/visual alarm remote annunciator with the following:
   1. Alarm silence and lamp test switch.
   2. LED annunciator lamps as follows:
      a. High battery voltage.
      b. Low battery voltage.
      c. Normal battery voltage.
      d. Generator running.
      e. Normal utility power.
      f. Genset supplying power.
      g. Pre-low oil pressure.
      h. Low oil pressure.
      i. Pre-high coolant temperature
      j. High coolant temperature.
      k. Low engine temperature.
      l. Overspeed.
      m. Overcrank.
      n. Not in automatic.
      o. Battery charger malfunction.
      p. Low fuel.
      q. Owner selected fault.

3. EXECUTION

3.1 INSTALLATION

A. Install emergency generator and accessories in accordance with the manufacturer's requirements.
B. Provide rebar reinforced concrete pad for emergency generator as recommended by the manufacturer.
C. Fill all engine fluids.
D. Leave diesel tank full.

3.2 START-UP AND TESTING

A. Initial start-up shall be performed by a factory-trained representative of the emergency generator manufacturer.

END OF SECTION 16620

SECTION 16670 - LIGHTNING PROTECTION SYSTEM

1. GENERAL

1.1 WORK INCLUDED
- A. Lightning Protection System

1.2 RELATED WORK
- A. Division 7 - Roofing
- B. Section 16450 - Grounding

2. PRODUCTS

2.1 COMPONENTS
- A. Thompson Lightning Protection Inc. as follows or equal:
  1. Air Terminal - #55, 1/2" x 12" copper point with #685 concealed base.
  2. Ground Rod - #TL5810, 5/8" x 10'-0" copper clad with #231 clamp.
  3. Class II Conductor - #28R, 28 strand, 14 gauge copper.
  4. Bonding devices, splicers and miscellaneous connectors shall be cast bronze type with bolted pressure connections. Crimp fittings are not acceptable.

2.2 ALTERNATE MANUFACTURERS
- A. Lightning Systems of VA, LLC
- B. Loehr Lighting Protection Company
- C. Certified Lightning Protection Company

3. EXECUTION

3.1 INSTALLATION
- A. Provide air terminals to insure all points are within 2'-0" of outside building edge, outside corners and ridge ends. Spacing shall not exceed 20'-0" on center and points shall project above protected area a minimum of 10".
- B. Protect roof mounted equipment (ac units and the like) as required. Maintain horizontal or downlead coursing of main conductor and insure that all bends have at least an 8" radius and do not exceed 90 degrees.
- C. Support cables at a maximum of 3'-0" on center. Cables shall be run concealed. Provide 1" rigid non-metallic conduit for downleads in walls, stub out a minimum of 6" below grade.

D. Top of ground rods shall be a minimum of 1'-0" below finished grade and located a minimum of 2'-0" from foundation walls.
E. Interconnect system with building electrical grounding system and piping systems as required by code.

3.2 QUALITY ASSURANCE

A. The contractor shall furnish all labor, materials, equipment and services to provide a complete lightning protection system for the structure included in this contract. The system shall include strike termination devices, interconnecting conductors, a proper grounding system, interconnection with other building grounded systems, and surge suppression at service entrances. The system design shall comply with the National Fire Protection Association (NFPA) Standard # 780, the Lightning Protection Institute (LPI) Standard # 175, and Underwriters' Laboratories, Inc. (UL) Standard # 96A. The manufacturer of the material components shall be a manufacturer member of the Lightning Protection Institute, and all materials shall be listed and labeled in accordance with the requirements of a nationally recognized testing laboratory. The system installation shall be made under the supervision of an LPI Certified Master Installer. Upon completion the contractor will deliver to the owner an as-built drawing stamped by the Master Installer and the appropriate system Certification documents under the LPI inspection program.

END OF SECTION 16670

SECTION 16721 - FIRE ALARM SYSTEM

1. GENERAL

1.1 WORK INCLUDED

A. Manual Fire Alarm System

1.2 RELATED WORK

A. Section 16110 - Raceways and Fittings
B. Section 16120 - Wire and Cable
C. Section 16130 - Boxes

2. PRODUCTS

2.1 INITIATING DEVICES

A. Manual pull stations: dual action type, semi-flush mounted.
B. Sprinkler flow switch: coordinate with sprinkler contractor
C. Tamper switch: coordinate with sprinkler contractor.
D. Duct mounted smoke detector: photoelectric type w/ auxiliary contacts for fan shut-down or damper release, coordinate sampling tube lengths with Division 15.
E. Ceiling mounted smoke detector: photoelectric type.
F. Ceiling mount heat detector: fixed temperature and rate-of-rise.
B. Provide addressable interfaces, relay modules and transformers required for a complete operating system.

2.2 SIGNALING DEVICES

A. Horn/Strobes: ADA compliant
B. Strobes: ADA compliant
C. Strobes shall be fully synchronized.

2.3 APPROVED VENDORS

A. Hawk Security-Harrisonburg
B. Vector Security-Harrisonburg
C. Simplex-Roanoke

2.4 CONTROLS

A. Fire-Lite MS-9200UDLS or equal, 198 point addressable fire alarm control panel with a digital alarm communicator/transmitter all on one circuit board.
   1. Removable terminal blocks, 2.0A of auxiliary power, connection for second ANN BUS, synchronization of up to 16 NAC power supplies and protection against electronic shock damage.
   2. Operating program shall be stored in a non-volatile memory that retains program in absence of operating power.

3. Panel shall provide power limiting on all circuits and automatic ground fault detection on all external wiring.
4. Panel shall have key-lockable door and surface mounted cabinet.
5. Remote annuciator shall be LCD display, English language in flush mount enclosure.

3. EXECUTION

3.1 SYSTEM OPERATION

A. On receipt of an alarm condition from an initiating device, the control panel shall sound evacuation signals throughout the building until the system is reset.
B. Provide separate indications at the control panel and remote annunciator to indicate which device is in alarm.
C. Provide an alarm signal to an approved central station system.
D. System is to be interfaced with the existing Municipal Building System as shown on the plans, existing monitoring account for the Owner shall be utilized for the off-site notification signals. Verify Requirements.
E. Coordinate with security contractor for any door/rolling gate release required, coordinate with elevator contractor for required recall and shunt trip.

3.2 INSTALLATION

A. Wiring for system shall be fire protective system cable or in conduit as directed by the system manufacturer.
B. Provide wiring, conduit and outlet boxes required for a complete system as indicated on the drawings, described herein and recommended by the system manufacturer.
C. Wires shall test free of grounds and crosses between conductors.

3.3 QUALITY ASSURANCE

A. Final connections between control equipment and the wiring system shall be made under direct supervision of a representative of the manufacturer.
B. Provide complete drawings and specifications of system wiring and device locations to the local authority as required for review prior to commencement of any work. Include any required calculations and product data required.

END OF SECTION 16721

SECTION 16730 - CONDUIT /CABLE TRAY SYSTEM

1. GENERAL

1.1 WORK INCLUDED
- A. Equipment Spaces
- B. Conduit for cable systems
- C. Cable tray for cable systems

1.2 RELATED WORK
- A. Section 16110 - Raceways and Fittings

2. PRODUCTS

2.1 COMPONENTS
- A. Conduit and Boxes
  1. Refer to Section 16110 for conduit
  2. Refer to Section 16130 for boxes
- B. Cable Tray
  1. B-line flextray system or equal, basket type tray, 4" deep, width as shown on the plans.
  2. Center post type supporting.
  3. Electroplated zinc galvanized finish.
- C. Pull cord
  1. Polypropylene rope.
- D. Equipment Space
  1. 3/4", fire rated plywood, smooth one side, full 8'-0" high, width as shown on the drawings.

3. EXECUTION

3.1 CONDUIT INSTALLATION
- A. Install as shown on plans.
- B. Provide pull string in conduits.
- C. Paint all sides and edges of equipment space with 2 coats of gray enamel paint prior to installation.

3.2 CABLE TRAY INSTALLATION

A. Run #4 ground wire alongside of tray and attach to each section and on each side of cut in accordance with NEMA standards.
B. Install in strict accordance with the manufacturer's recommendations.
C. Support at a minimum 5'-0" on center.
D. Ceiling space is a premium on the project, provide an additional 20% of each size tray to allow for field bends and offsets required by sprinkler piping, ductwork and structural members that may be encountered. In general cable tray should be routed to be as accessible as possible below all other trades.

END OF SECTION 16730

SECTION 16740 - IT CABLE SYSTEM

1. GENERAL

1.1 WORK INCLUDED

A. Category 6 Cable
B. Coax Cable
C. Fiber Cable
D. Jacks and Trim

1.2 RELATED WORK

A. Section 16110 - Raceways and Fittings
B. Section 16120 - Wire and Cable
C. Section 16130 - Boxes
D. Section 16730 - Conduit/Cable Tray

2. PRODUCTS

2.1 VOICE AND DATA

A. Category 6 Cable and 24 strand single mode fiber cables.
B. All equipment required for a complete turnkey system. It is the intent to move from existing facility into the new and have everything in place for a quick turnover. Close coordination will be required with the City's IT director. Provide all equipment required for a complete system, including but not limited to bulk cable, patch panels, patch cables, wiring blocks and jacks.
C. Wireless access points shall be Aruba AP 115.
D. Jacks shall category 6, dual port wall or in floor box as shown on plans.

2.2 TELEVISION

A. RG-6 low loss coax.

3. EXECUTION

3.1 INSTALLATION

A. Pull (2) Cat. 6 cables to each location.
B. Pull fiber to from each wiring backboard to the server room, pull fiber from headend equipment to server room to connect to incoming 3rd parties (Comcast, Lumos etc.)
C. Pull coax and Cat.6 cables from each television outlet to the wiring backboard on the respective floor, provide coax between boards and on to server room.
D. Cabling system shall be fully tested and certified prior to Owner relocation.

END OF SECTION 16740

SECTION 16770 - SECURITY SYSTEM

1. GENERAL

1.1 WORK INCLUDED
- A. Security System

1.2 RELATED WORK
- A. Section 16110 - Raceways and Fittings
- B. Section 16120 - Wire and Cable
- C. Section 16130 - Boxes

2. PRODUCTS

2.1 SYSTEMS
- A. Duress alarm system for Treasurer's Office and Council Chambers as shown on plans.
- B. CCTV camera system for Treasurer's Office and Vault areas.
- C. Pass key system for doors as specified in the hardware schedule.

2.3 APPROVED VENDORS
- A. Hawk Security-Harrisonburg
- B. Vector Security-Harrisonburg
- C. ADT-Richmond

3. EXECUTION

3.1 SYSTEM OPERATION
- A. Systems shall be turnkey complete.
- B. Duress alarm system shall notify off-site.
- C. CCTV shall monitor and record Treasurer's Office activities.
- D. Pass key shall be compatible with door hardware specified and shall be similar to other systems that the City currently has in use at other facilities.

END OF SECTION 16770

END OF DIVISION 16

APPENDIX

FROEHLING & ROBERTSON, INC.

Report of Geotechnical Study

Harrisonburg Municipal Building
Harrisonburg, Virginia
F&R Project No. 71R3003

Prepared For:
City of Harrisonburg
320 East Mosby Road
Harrisonburg, Virginia 22801

Prepared By:
Froehling & Robertson, Inc.
6181 Rockfish Gap Turnpike
Crozet, Virginia 23932-3330

October 16, 2013

SINCE 1881

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881

6181 Rockfish Gap Turnpike
Crozet, Virginia 22932-3330
T 434.823.5154 I F 434.823.4764

October 16, 2013

City of Harrisonburg
320 East Mosby Road
Harrisonburg, Virginia 22801

Attn: Mr. Thomas Hartman, PE, LEED AP

Reference: Report of Geotechnical Study
Harrisonburg Municipal Building
Harrisonburg, Virginia
F&R Project No. 71R3003

Dear Mr. Hartman:

The purpose of this study is to present the results of the subsurface exploration program and geotechnical engineering evaluation undertaken by Froehling & Robertson, Inc. (F&R) in connection with the referenced project. Our services were performed in general accordance with F&R Proposal No. 1471-135G rev1 dated August 27, 2013. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and general subsurface conditions, and presents our geotechnical evaluations and recommendations.

We have enjoyed working with you on this project, and we are prepared to assist you with the recommended quality assurance monitoring and testing services during construction. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,
FROEHLING & ROBERTSON, INC.

COMMONWEALTH OF VIRGINIA
BRENDAN L. QUIRK
Lic. No. 050602
10-16-13
PROFESSIONAL ENGINEER

Brendan L. Quirk, P.E.
Staff Geotechnical Engineer

Clyde A. Simmons, III, P.E.
Senior Engineer/Branch Manager

F:\Projects 71R\71R3003 (Harrisonburg Municipal Bldg)\Harrisonburg Municipal Building Report.docx

TABLE OF CONTENTS

SECTION	PAGE
EXECUTIVE SUMMARY	1
1.0 PURPOSE & SCOPE OF SERVICES	2
2.0 PROJECT INFORMATION	3
2.1 SITE DESCRIPTION	3
2.2 PROPOSED CONSTRUCTION	3
3.0 EXPLORATION PROCEDURES	3
3.1 SOIL BORINGS	3
3.2 LABORATORY TESTING	5
4.0 REGIONAL GEOLOGY & SUBSURFACE CONDITIONS	5
4.1 REGIONAL GEOLOGY	5
4.2 SUBSURFACE CONDITIONS	7
4.2.1 General	7
4.2.2 Surficial Organics	8
4.2.3 Pavement	8
4.2.4 Residual Soils	8
4.2.5 Soft Weather Rock	9
4.2.6 Auger Refusal Materials	9
4.3 SUBSURFACE WATER	9
5.0 GEOTECHNICAL DESIGN RECOMMENDATIONS	10
5.1 GENERAL	10
5.2 FOUNDATION DESIGN	11
5.3 GROUND FLOOR SLABS	12
5.4 LATERAL EARTH PRESSURES	12
5.5 SEISMIC CONSIDERATIONS	14
6.0 GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS	14
6.1 SITE PREPARATION	14
6.2 EXCAVATION CONDITIONS	15
6.3 FOUNDATION CONSTRUCTION	16
6.4 STRUCTURAL FILL PLACEMENT AND COMPACTION	16
6.5 SURFACE WATER/GROUNDWATER CONTROL	17
6.6 TEMPORARY EXCAVATION RECOMMENDATIONS	17
6.7 SEEPAGE EROSION	18
7.0 CONTINUATION OF SERVICES	19
8.0 LIMITATIONS	20

APPENDICES

APPENDIX I

Site Vicinity Map (Drawing No. 1)
Boring Location Plan (Drawing No. 2)

APPENDIX II

Key to Soil Classification
Unified Soil Classification System
Typical Diagram of Limestone Profile
Rock Sub-Excavation Detail
Lab Test Results
Boring Logs
Subsurface Profiles

APPENDIX III

ASFE Document "Important Information about Your Geotechnical Engineering Report"

EXECUTIVE SUMMARY

This Executive Summary is provided as a brief overview of our geotechnical engineering evaluation for the project and is not intended to replace more detailed information contained elsewhere in this report. As an overview, this summary inherently omits details that could be very important to the proper application of the provided geotechnical design recommendations. This report should be read in its entirety prior to implementation into design and construction.

- The site was explored by five soil test borings performed on September 23, 2013. Site subsurface conditions generally consisted of residual soils overlying soft weathered rock and/or auger refusal materials. Auger refusal materials were encountered in each boring at depths ranging from 12 feet to 20 feet below existing grades.
- Based on the subsurface information obtained during our exploration, we expect that shallow foundation support bearing on firm residual soils for the structure will be feasible. F&R recommends that a net allowable bearing pressure not to exceed 2,500 psf be used for foundation design.
- The following Seismic Site Class Definition was established per Section 1613.5.2 of the 2012 International Building Code (IBC). Based on our experience in this area and the data from our testing and subsurface exploration, a **Site Classification "C"** should be used for further evaluations relative to earthquake load design.

1.0 PURPOSE & SCOPE OF SERVICES

The purpose of the subsurface exploration and geotechnical engineering evaluation was to explore the subsurface conditions on the project site and provide geotechnical engineering evaluation and construction recommendations that can be used during planning process of the proposed structure and site work.

F&R's scope of services included the following:

- Visited the site to observe existing surface conditions;
- Coordinated utility clearance with Miss Utility;
- Reviewed readily available geologic and subsurface information relative to the project site;
- Completion of five soil test borings to depths of 12 feet to 20 feet below the existing ground surface;
- Performed laboratory testing on selected soil samples, consisting of water content, wash sieve analysis, and Atterberg Limits;
- Preparation of typed Boring Logs and development of a Subsurface Profile;
- Performing a geotechnical engineering evaluation of the subsurface conditions with regard to their suitability for the proposed construction;
- Provided recommendations for slab on grade design and construction;
- Provided lateral earth pressure parameters for the design of below grade walls;
- Provided recommendations regarding the placement and compaction of fill materials required to achieve building pad or site subgrades, including an assessment of the suitability of the on-site soil for re-use as structural fill.
- Provided a *seismic site class definition*. The *seismic site class definition* was assigned based on the test boring Standard Penetration Test data and correlations provided in the 2012 IBC;
- Preparation of this geotechnical report by professional engineers.

Our scope of services did not include a survey of the boring locations, quantity estimates, preparation of plans or specifications, or the identification and evaluation of wetland or other environmental aspects of the project site.

2.0 PROJECT INFORMATION

2.1 Site Description

The project site is currently occupied by the active parking lot located between the Community Development building and the existing municipal building in Harrisonburg, Virginia (See Site Location Plan, Drawing No. 1, Appendix I). The site is west of S. Main Street, north of Warren Street, and east of S. Liberty Street. The project area generally consists of asphalt pavements with small grass lawns to the east and west. Topographically the area gently slopes from El 1323 in the east down to El 1315 in the west. Some rock outcrops are evident to the west of the site along the south side of the existing drive lane.

The existing municipal building consists of a 2-story, with partial basement level, brick and stone building. No signs of significant structural damage were noted during a visual scan of the building's exterior, except for some patchwork of "stair-step" cracking within the veneer at a few of the building's corners and above many windows.

2.2 Proposed Construction

Project information was provided in email correspondence with you, which included the draft "Site Layout" and "Erosion Sediment Control" plans by Blackwell Engineering, dated 8/13/13, and the "Proposed New Municipal Building" drawings by Mather Architects, P.C., Sheets A1.1 and A1.2, dated 8/20/13.

It is understood that a new three story municipal building is planned for the project site, which will extend south of the existing municipal building. We understand that the Community Development building, located just south of the proposed structure, will be demolished for this project, with a parking lot constructed in its place. The provided information indicates that a partial basement is planned for the eastern portion of the building, while the remainder of the structure will be at-grade. While proposed grades have not yet been established, we have assumed that the basement and first floor of the new building will match the existing basement and first floor at El 1313.5 and El 1323.28, respectively. This will result in cuts and fills of 5 feet or less. We understand that column loads will be less than 200 kips.

3.0 EXPLORATION PROCEDURES

3.1 Soil Borings

The exploration program was performed on September 23, 2013, and consisted of five soil test borings designated B-1 through B-5. Each of the soil test borings were drilled until encountering auger refusal materials. Boring depths varied from 12 feet to 20 feet. The locations of the borings are shown on the attached Boring Location Plan (Drawing No. 2). The planned boring locations were determined and staked in the field by F&R by measuring from

existing site features such as building corners, edges of pavement, etc. Surface elevations at the boring locations were estimated to the nearest foot from the topography indicated on the provided draft site plans. In consideration of the methods used in their determination, the test boring locations shown on the attached boring location plan and the elevations shown on the boring logs should be considered approximate.

The soil test borings were performed in accordance with generally accepted practice using truck and truck-mounted CME-55 rotary drill rigs equipped with an automatic safety hammer. Hollow-stem augers were advanced to pre-selected depths, the center plug was removed, and representative soil samples were recovered with a standard split-spoon sampler (1 3/8 in. ID, 2 in. OD) in general accordance with ASTM D 1586, the Standard Penetration Test. For these tests, a weight of 140 pounds was freely dropped from a height of 30 inches to drive the split-spoon sampler into the soil. The number of blows required to drive the split-spoon sampler three consecutive 6-inch increments was recorded, and the blows of the last two increments were summed to obtain the Standard Penetration Resistance (N-value). The N-value provides a general indication of in-situ soil conditions and has been correlated with certain engineering properties of soils.

Research has shown that the Standard Penetration Resistance (N-value) determined by automatic hammer is different than the N-value determined by the safety hammer method. Most corrections that are published in the technical literature are based on the N-value determined by the safety hammer method. This is commonly termed N_{60} as the rope and cathead with a safety hammer delivers about 60 percent of the theoretical energy delivered by a 140-pound hammer falling 30 inches. Several researchers have proposed correction factors for the use of hammers other than the safety hammer. The correction is made by the following equation:

$$N_{60} = N_{field} \times C_E$$

where N_{field} is the value recorded in the field, and C_E is the drill rod energy ratio for the hammer used. A correction factor (C_E) of 1.3 was utilized for the automatic hammer used during the drilling of borings for this site, based on previous energy measurements made for the automatic hammer system. Plotted N-values reported on Boring Logs are the actual, field-derived blow counts (N_{field}). Drilling notes on each Boring Log indicates whether penetration resistances presented on the Boring Log were determined using automatic hammer or conventional hammer systems. Corrected N_{60} values were used for all analyses.

In some soils it is not always practical to drive a split-spoon sampler the full three consecutive 6-inch increments. Whenever more than 50 blows are required to drive the sampler over a 6-inch increment, or the sampler is observed not to penetrate after 10 blows, the condition is

called split-spoon refusal. Split-spoon refusal conditions may occur because of obstructions or because the earth materials being tested are very dense or very hard. When split-spoon refusal occurs, often little or no sample is recovered. The SPT N-value for split-spoon refusal conditions is typically estimated as > 100 blows per foot (bpf). Where the sampler is observed not to penetrate after 10 blows, the N-value is reported as 10/0. Otherwise, the depth of penetration after 50 blows is reported in inches, i.e. 50/5, 50/2, etc.

The test borings were advanced through the soil overburden by soil drilling procedures until auger refusal material was encountered. Subsurface water level readings were taken in each of the borings during the drilling process. Upon completion of drilling, the boreholes were backfilled with auger cuttings (soil) and capped with asphalt cold patch, as necessary. Periodic observation of the boreholes should be performed to monitor subsidence at the ground surface, as the borehole backfill could settle over time.

Representative portions of the split-spoon soil samples obtained throughout the exploration program were placed in glass jars and transported to our laboratory. In the laboratory, the soil samples were evaluated by a member of our engineering staff in general accordance with techniques outlined in the visual-manual identification procedure (ASTM D 2488). The soil descriptions and classifications discussed in this report and shown on the attached Boring Logs are based on visual observation and should be considered approximate. A copy of the boring logs are provided and classification procedures are further explained in Appendix II.

Split-spoon soil samples recovered on this project will be stored at F&R's office for a period of 60 days. After 60 days, the samples will be discarded unless prior notification is provided to us in writing.

3.2 Laboratory Testing

Representative soil samples were subjected to Water Content (ASTM D 2216), #200 Sieve Wash (ASTM D 1140), and Atterberg Limits (ASTM D 4318) to substantiate the visual classifications and assist with the estimation of the soils' pertinent engineering properties. The results are shown in Section 4.4.

4.0 REGIONAL GEOLOGY & SUBSURFACE CONDITIONS

4.1 Regional Geology

The project site is located in Virginia's Valley and Ridge Geologic Province which is underlain by ancient faulted and folded limestones, dolomites, shales and sandstones of Paleozoic age. Information obtained from publication entitled Geology of Harrisonburg and Bridgewater, Quadrangles, Virginia (Commonwealth Division of Mineral Resources Publication 60, 1986) indicates that this area is located over the Ordovician age carbonate rocks which are a part of

the New Market formation. The New Market is a bedded limestone consisting of massive calcilutites with algal laminae and birds-eye structures and ranges from 150 to 300 feet thick. The virgin soils encountered in this area are the residual product of in-place chemical and mechanical weathering of the parent bedrock formation that underlies the site. These materials consist of clayey soils near the surface where soil weathering is more advanced, underlain by silty material.

Often, these rocks weather to form a highly variable bedrock surface consisting of troughs and pinnacles that may greatly fluctuate in elevation within short lateral distances. Sometimes, the interbedded layers after weathering will result in alternating rock and soil seam layers that can be oriented near vertical. The varying susceptibility to weathering creates seams of soil sandwiched between weather-resistant rock pinnacles.

From an excavation and support point of view, this near vertical orientation can result in very hard layers that may require blasting to excavate, interbedded with soft clay seams that may require undercutting to some depth to provide adequate structural support. Where soil test borings encountered a vertical bed of auger refusal material, direct interpretation of the field data might lead one to envision a rock surface between the auger refusal points. Likewise, where vertical soil seams are encountered, a deep soft soil profile might be anticipated. However, in the Valley and Ridge physiographic province our experience is that a combination of both conditions may exist. Therefore, the boring data should be viewed as a specific example of the subsurface condition at each explored location rather than a broad interpretation of conditions across the site area.

Limestone and dolomite are composed of calcium carbonate and calcium magnesium carbonate, respectively, with the relative proportion of magnesium to calcium being used to distinguish the two types of rock. Impurities (i.e., silicates, sulfides, and other mineral groups) within these rock formations occur either as distinct beds of shale or siltstone, or may be widely dispersed throughout the rock. Carbonate rocks are susceptible to dissolution in the presence of subsurface water. The mineral residues remaining after the carbonates are eroded are known as residual soils, and typically consist of medium to highly plastic silts and clays.

Continued subsurface dissolution of the carbonate bedrock may lead to development of a highly irregular rock profile that may include underground voids. Over time, the soils overlying a void may subside, in a continual process of subsurface chemical erosion of bedrock and infilling by overburden soils. The resulting ground surface depression is known as a sinkhole. Terrain characterized by sinkholes and other solutional features is known as karst. See attached conceptual model of carbonate geology provided by ATS International in Appendix II.

There are numerous other variations on sinkhole development. Regardless of the mode of development, it is important to note that changes in soil stress and water regime can greatly accelerate sinkhole development. Natural geologic processes that might otherwise occur over thousands of years can occur within several years or even months. Construction activities such as site grading, building construction, change in water flow and water impoundment have reportedly caused sinkholes to develop rapidly or to collapse suddenly. This site lies within a geologic formation known to contain solutional features; however, the potential for development of sinkholes, along with the rate at which a sinkhole will develop, are not easily determined or accurately predicted.

The transitional term "Hard or Soft Weathered Rock" is normally found overlying the parent bedrock. For engineering purposes, SWR is described as broken and partially weathered rock with Standard Penetration Resistance N-values between 50 blows per 6 inches and 50 blows per inch. HWR is described as broken and partially weathered rock with N values in excess of 50 blows per inch.

Weathering is facilitated by fractures, joints and the presence of less resistant rock types. Consequently, the profile of the SWR or HWR is often quite irregular, even over very short horizontal distances. Also, it is not unusual to find lenses, layers, or zones of less resistant SWR and more resistant HWR, and boulders of hard rock within the soil mantle well above the general bedrock level.

4.2 Subsurface Conditions

4.2.1 General

The subsurface conditions discussed in the following paragraphs and those shown on the attached Boring Logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the boring logs. Sometimes the relatively small sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. In these cases, we qualify our origin descriptions with "possible" before the word describing the material's origin (i.e. possible fill, etc.). Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Data from the specific soil test borings is shown on the attached Boring Logs in Appendix II.

A Subsurface Profile has been prepared from the boring data to graphically illustrate the subsurface conditions encountered at the site. The Subsurface Profile can be found after the boring logs in Appendix II. Strata breaks designated on the Boring Logs and Subsurface Profile represent approximate boundaries between soil types. The transition from one soil type to another may be gradual or occur between soil samples. This section of the report provides a general discussion of subsurface conditions encountered within areas of proposed construction at the project site.

Below the existing ground surface, the borings generally encountered surficial organics, pavement, residual soils, soft weathered rock and auger refusal materials. These materials are generally discussed in the following paragraphs.

4.2.2 Surficial Organics

Surficial soils were encountered in boring B-2 and extended to an approximate depth of 4 inch inches. Surficial organic soil is typically a dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. F&R has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed surficial organic soil materials. Therefore, the term surficial organic soil is not intended to indicate a suitability for landscaping and/or other purposes. The surficial organic soil depths provided in this report are based on driller observations and should be considered approximate. We note that the transition from surficial organic soil to underlying materials may be gradual, and therefore the observation and measurement of surficial organic soil depths is subjective. Actual surficial organic soil depths should be expected to vary.

4.2.3 Pavement

Borings B-1, B-3, B-4, and B-5 encountered an asphaltic concrete pavement section consisting of 4 inches of asphaltic concrete over 5 inches to 8 inches of gravel. It should be noted that these measurements are not based on core samples and should only be considered approximate.

4.2.4 Residual Soils

Residual soil, formed by the in-place weathering of the parent rock, was encountered at each boring location, below the existing surficial soils or pavement, and extended to the boring until encountering soft weathered rock or auger refusal. The residual soil was generally described as fat CLAY (CH) and lean CLAY (CL) with varying amounts of sand and gravel. The sampled residuum was brown, light brown, dark brown and gray in color, with moisture contents visually characterized as moist to very moist. The Standard Penetration Test values (N-Values) in the residuum ranged from 2 bpf to 35 bpf.

4.2.5 Soft Weather Rock

Soft weathered rock (SWR) is a transitional material between soil and rock which contains the relic structure of the rock with very hard consistencies or very dense densities. SWR materials were encountered in borings B-3 and B-5 at depths of 18.5 feet and 13.5 feet below existing grades, respectively, and extended to auger refusal. When sampled, the SWR became a gravelly fat CLAY (CH), and clayey GRAVEL (GC). Sampled SWR materials were gray and brown in color with moisture contents visually characterized as very moist to wet. SPT values in SWR ranged from 50/6 to 50/1.

4.2.6 Auger Refusal Materials

Auger refusal occurs when materials are encountered that cannot be penetrated by the soil auger and is normally indicative of a very hard or very dense material, such as boulders, rock lenses, rock pinnacles, or the upper surface of rock. Auger refusal was encountered in each boring at depths of 12 feet to 20 feet below existing grades. Auger refusal conditions with a CME 55 do not necessarily indicate conditions impenetrable to other equipment. Auger refusal conditions will likely vary in unexplored areas of the site. A summary of the auger refusal conditions can be found in the table below.

Boring No.	Existing Grade	SWR Depth (ft)	SWR Elevation	AR Depth (ft)	AR Elevation
B-1	1315	--	--	12	1303
B-2	1315	--	--	12.5	1302.5
B-3	1318	18.5	1299.5	20	1298
B-4	1320	--	--	12	1308
B-5	1322	13.5	1308.5	14	1308

4.3 Subsurface Water

The test borings were monitored during and after drilling operations to obtain short-term subsurface water information. Subsurface water was not encountered during drilling or upon removal of the augers in any of the borings. It should be noted that the location of the subsurface water table could vary by several feet because of seasonal fluctuations in precipitation, evaporation, surface water runoff, local topography, and other factors not immediately apparent at the time of this exploration. Normally, the highest subsurface water levels occur in the late winter and spring and lowest levels occur in the late summer and fall.

4.4 Laboratory Test Results

As discussed in Section 3.2, laboratory testing was performed on representative soil samples collected during our subsurface exploration. The natural moisture content of the tested samples ranged from 18.9% to 30.4%. The tested soil samples classified as lean CLAY (CL) and fat CLAY (CH), with liquid limits of 49 to 56, plasticity indices of 28 to 33, and with fines contents of 90.1% to 95.8% (passing the #200 sieve). The laboratory test results can be found in Appendix II.

Boring No.	Sample Depth (Feet)	Natural Water Content (%)	Liquid Limit/ Plasticity Index	% Passing No. 200 Sieve	USCS Class.
B-1	3.5-5	20.9	49/28	92.8	CL
B-1	6-7.5	25.5	--	--	--
B-1	8.5-10	30.4	--	--	--
B-2	1-2.5	24.4	55/33	95.8	CH
B-4	1-2.5	26.8	--	--	--
B-4	3.5-5	23.9	--	--	--
B-4	6-7.5	21.1	--	--	--
B-5	1-2.5	18.9	--	--	--
B-5	3.5-5	24.1	56/31	90.1	CH
B-5	6-7.5	28.0	--	--	--

5.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

5.1 General

The following evaluations and recommendations are based on our observations at the site, interpretation of the field obtained during this exploration, and our experience with similar subsurface conditions and projects. Soil penetration data has been used to evaluate relative consistency and compressibility of the underlying soil stratum using established correlations. Subsurface conditions in unexplored locations may vary from those encountered. If the structure locations, loadings, or elevations are changed, we should be notified and requested to confirm and, if necessary, re-evaluate our recommendations.

Determination of an appropriate foundation system for a given structure is dependent on the proposed structural loads, soil conditions, and construction constraints such as proximity to other structures, etc. The subsurface exploration aids the geotechnical engineer in determining the soil stratum appropriate for structural support. This determination includes considerations with regard to both allowable bearing capacity and compressibility of the soil strata. In addition, since the method of construction greatly affects the soils intended for structural support, consideration must be given to the implementation of suitable methods of site preparation, fill compaction, and other aspects of construction, where applicable.

5.2 Foundation Design

Based on the boring data, we envision that the proposed building can be supported by shallow foundations bearing on firm residual soils, or newly placed controlled and compacted fill. We recommend that foundations be designed for a net allowable bearing pressure not to exceed 2,500 pounds per square feet (psf).

We expect that the new foundations will bear at approximately the same elevation as the existing municipal building's foundations. However, if excavations will be taking place within the "zone of influence" of the existing building's foundations, then underpinning will be needed. The "zone of influence" extends downward from the existing bottom edge of footing at a slope of 1H:1V. Also, if new foundations are to bear at higher levels than the neighboring foundations, then it is prudent to note that overlapping stress on the existing foundation soils and surcharging the basement wall with additional stresses should be considered. The effects of these additional stresses must be considered by the structural engineer.

In addition, due to the pinnacled nature of the site's underlying geology, it is possible that foundations could bear directly on bedrock materials. At locations where footing support transitions from soil to rock, we recommend that a "rock cushion", consisting of at least 12 inches of compacted soil be placed between the rock and the footing (refer to Rock Sub Excavation Detail, Appendix II). This should reduce the potential for a point loading on the footing.

To reduce the possibility of localized shear failures, column and wall footings should be a minimum of 3 feet and 2 feet wide, respectively. The soils encountered in the borings were classified as lean CLAY (CL) and fat CLAY (CH). It should be understood that clayey soils are considered to be moderately expansive. We recommend that all exterior footings be placed a minimum of 3 feet below finished exterior grades to satisfy shrink-swell considerations, which should be below the zone of seasonal moisture fluctuation, and should also be adequate to protect exterior footings against the effects of frost.

5.3 Ground Floor Slabs

Ground floor slabs may be designed as a slab-on-grade supported by firm residual soils or controlled compacted fill. Any loose/soft or otherwise unsuitable materials should be remediated as judged necessary by the Geotechnical Engineer. We recommend that the slab-on-grade be underlain by 4-inches of well-compacted granular materials, which should conform to an open graded aggregate (such as VDOT No. 57 Stone). This granular material provides a capillary break between the subgrade and slab-on-grade; while also providing a uniform bearing surface. A vapor retarder should be used beneath ground floor slabs that will be covered by tile, wood, carpet, impermeable floor coatings, and/or if other moisture-sensitive equipment or materials will be in contact with the floor. However, the use of vapor retarders may result in excessive curling of floor slabs during curing. We refer the floor slab designer to ACI 302.1R-96, Sections 4.1.5 and 11.11, for further discussion on vapor retarders, curling, and the means to minimize concrete shrinkage and curling.

Proper jointing of the ground floor slab is also essential to minimize cracking. ACI suggests that unreinforced, plain concrete slabs may be jointed at spacings of 24 to 36 times the slab thickness, up to a maximum spacing of 18 feet. Floor slab construction should incorporate isolation joints along bearing walls and around column locations to allow minor movements to occur without damage. Utility or other construction excavations in the prepared floor subgrade should be backfilled to a controlled fill criteria to provide uniform floor support.

Structural analyses and design of floor slab foundation may require the use of a vertical modulus of subgrade reaction (k). We note that typical practice for slab-on-grade and pavement design is to provide a “k” value based on published correlation with soil types and California Bearing Ratio (CBR) test values. Such correlations are based on empirical data from plate load tests. The plate load test sufficiently models typical floor and wheel loads that exert stresses on the order of 3 to 5 feet. Based on published correlations, we estimate that a design modulus of subgrade reaction (k) = 150 pci is appropriate for floor slab design calculations, provided that the recommended 4-inch subbase is utilized.

5.4 Lateral Earth Pressures

We understand that the structure will have a partial basement level. All below-grade walls should be designed to resist the lateral earth pressure.

Earth pressures on walls below grade are influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction, and the strength of the materials being restrained. The most common conditions assumed for earth retaining wall design are the active and at-rest conditions. Active conditions apply to relatively flexible earth

retention structures, such as freestanding walls, where some movement and rotation may occur to mobilize soil shear strength. Walls that are rigidly restrained, such as basement, pit, pool and tunnel walls, should be designed for the structure requiring the use of at-rest earth pressures.

A third condition, the passive state, represents the maximum possible pressure when a structure is pushed against the soil, and is used in wall foundation design to help resist active or at-rest pressures. Because significant wall movements are required to develop the passive pressure, the total calculated passive pressure should be reduced by one-half to two-thirds for design purposes.

The fat CLAY (CH) and lean CLAY (CL) soils that were encountered in each of the borings are not considered suitable for use as below grade wall backfill due to the relatively high earth pressures they exhibit, poor drainage properties, and potential excess pressures due to swelling. We recommend that VDOT No. 57 Stone be used as below grade wall backfill. The recommended lateral earth pressure coefficients and equivalent fluid pressure parameters for design of retaining or below grade walls using these soils are provided in the following table.

Soil Type	**Base Friction Coefficient**	**Lateral Earth Pressure Coefficient (k)**		**Equivalent Fluid Unit Weight (γ_{eq}, pcf)**		
		At-rest	Active	At-rest	Active	Passive
VDOT No. 57 Stone	0.34	0.36	0.22	41	25	275

A moist unit weight of 115 pcf for soil should be used for design calculations using the No. 57 Stone. The backfill material should be extended a minimum distance of 0.5 times the wall height laterally from the back face of the wall, or for a cantilevered wall, from the heel of the wall footing.

Our recommendations were given assuming that the ground surface above the wall is level. The recommended equivalent fluid pressures were provided assuming that constantly functioning drainage systems, consisting of slotted 4 inch diameter PVC pipe, are installed between walls and crushed stone backfill to prevent the accidental buildup of hydrostatic pressures and lateral stresses in excess of those stated. If a functioning drainage system is not installed, then lateral earth pressures should be determined using the buoyant weight of the soil. Hydrostatic pressures calculated with the unit weight of water (62.4 pcf) should be added to these earth pressures to obtain the total stresses for design.

Heavy equipment should not operate within 5 feet of below grade walls to prevent lateral pressures in excess of those cited. Adjacent footings or other surcharge loads located a short distance outside below grade walls will also exert appreciable additional lateral pressures. Surcharge loads should be evaluated using the appropriate active or at-rest pressure coefficients provided above. The effect of surcharge loads should be added to the recommended earth pressures to determine total lateral stresses.

5.5 Seismic Considerations

The following Seismic Site Class Definition was established per Section 1613.5.2 of the 2012 International Building Code (IBC). Our scope of services did not include a seismic conditions survey to determine site-specific shear wave velocity information. IBC 2012 provides a methodology for interpretation of Standard Penetration Test resistance values (N-values) to determine a Site Class Definition. This method requires averaging N-values over the top 100 feet of the subsurface profile. Based on our experience in this area and the data from our testing and subsurface exploration and in general accordance with Section 1613.5.2 of the 2012 IBC, a **Site Classification "C"** should be used for further evaluations relative to earthquake load design.

6.0 GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

6.1 Site Preparation

Before proceeding with construction, existing structures, utilities, surficial organic soils, asphalt, concrete and crushed stone, and other deleterious non-soil materials (if any) should be stripped or removed from the proposed construction area. Attention should be given to these areas to ensure all unsuitable material is removed prior to continuing with construction. During the site preparation operations, positive surface drainage should be maintained to prevent the accumulation of water. Existing underground utilities should be re-routed to locations a minimum of 10 feet outside of any proposed structures or abandoned in place with flowable fill.

After stripping, areas intended to support ground floor slabs or new fill should be carefully evaluated by a geotechnical engineer. At that time the engineer may require proofrolling of the subgrades with a 20 to 30-ton loaded truck or other pneumatic-tired vehicle of similar size and weight. Proofrolling should be performed during a time of good weather and not while the site is wet, frozen, or severely desiccated. The purpose of the proofrolling is to locate soft, weak, or excessively wet soils present at the time of construction.

The proofrolling observation is an opportunity for the geotechnical engineer to locate inconsistencies intermediate of our boring locations and evaluate the stability of the existing subgrade materials. Any unsuitable materials observed during the evaluation and proofrolling operations should be undercut and replaced with compacted or flowable fill, or stabilized in-place. Low consistency soils which will require undercutting were encountered at a depth of 1-2.5 feet in borings B-1 and B-3. The possible need for, and extent of, undercutting and/or in-place stabilization required can best be determined by the geotechnical engineer at the time of construction. Once the site has been properly prepared, at-grade construction may proceed.

6.2 Excavation Conditions

Auger refusal materials were encountered in each of the borings but below the anticipated upgrade levels. However, due to the pinnacled nature of the underlying geology, difficult excavation conditions may be encountered at some areas on this site. F&R notes that the profile of the bedrock surface will be highly irregular, and that bedrock could be encountered at higher elevations between test boring locations.

In mass excavations for general sitework, hard or dense soils (soils with standard penetration resistances of 30 or more blows per foot) can usually be removed by ripping with a single-tooth ripper attached to a large crawler tractor or by breaking it out with a tracked excavator or large front-end loader. Blasting is not anticipated to be necessary at this site, based on the borings, and is not recommended due to the proximity of existing structures. In confined excavations such as foundations, utility trenches, etc., removal of partially weathered rock typically requires use of large backhoes, pneumatic spades, or hoe rams. The gradation of the material removed by ripping or hoe ramming is typically erratic, making it unsuitable for use as structural fill.

The definition of rock can be a source of conflict during construction. The following definitions have been incorporated into specifications on other projects and are provided for your general guidance:

<u>GENERAL EXCAVATION:</u>

<u>Rip Rock</u> - Any material that cannot be removed by scrapers, loaders, pans, dozers, or graders; and requires the use of a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds.

<u>Blast Rock</u> - Any material which cannot be excavated with a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D-8K or equivalent) or by a Caterpillar

977 front-end loader or equivalent; and occupying an original volume of at least one (1) cubic yard.

TRENCH EXCAVATION:

Blast Rock - Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one-half (1/2) cubic yard.

6.3 Foundation Construction

All foundation subgrades should be observed, evaluated, and verified for the design bearing pressure by the geotechnical engineer after excavation and prior to reinforcement steel placement. If low consistency soils are encountered during foundation construction, localized undercutting and/or in-place stabilization of foundation subgrades will be required. Soft soils which would require undercutting were encountered in borings B-1 and B-3. The actual need for, and extent of, undercutting should be based on field observations made by the geotechnical engineer at the time of construction.

Excavations for footings should be made in such a way as to provide bearing surfaces that are firm and free of loose, soft, wet, or otherwise disturbed soils. Foundation concrete should not be placed on frozen or saturated subgrades. If such materials are allowed to remain below foundations, settlements will increase. Foundation excavations should be concreted as soon as practical after they are excavated. If an excavation is left open for an extended period, a thin mat of lean concrete should be placed over the bottom to minimize damage to the bearing surface from weather or construction activities. Water should not be allowed to pond in any excavation.

6.4 Structural Fill Placement and Compaction

Fill materials may consist of the non-organic on-site soils, or an off-site borrow having a classification of CL or more granular, as defined by the Unified Soil Classification System. Controlled structural fill should have a maximum particle size of 4 inches and should be free of organics or other deleterious materials. Recommendations and additional restrictions for backfilling the below grade walls were provided in Section 5.4 of this report.

Based on our visual classifications and the laboratory testing, we anticipate that the on-site soils should serve satisfactorily as fill provided that the moisture contents can be maintained within acceptable limits. The on-site soils are considered moisture sensitive and may be difficult to work with when they are wet of the optimum moisture content. The laboratory tests indicate that some of the samples were above their optimum water contents, while others were below the optimum water content. Therefore, some wetting or drying of the on-site soils should be anticipated.

Predicated on the boring and laboratory results, and the recommendations provided above, the best time for construction of the structural fills and compacted subgrades would be during the warmer, drier months of the year, such as from late April through early October. During this time frame, on-site soils that are wet of optimum can usually be dried to near optimum levels with relatively little effort. If grading is performed during the colder, wetter months of the year, such as late October through early April, and suitable dry materials are not available on site, then off-site drier borrow sources will likely be necessary.

The fill should be placed in horizontal lifts, 8 inches in loose thickness, and compacted to at least 95 percent of the maximum dry density as determined by the Standard Proctor compaction test (ASTM D 698). Where portable compaction equipment is used, such as utility trenches, the lift thickness may need to be reduced to 4 inches to achieve the required degree of compaction. Excessively wet or dry soils should not be used as fill materials without proper drying or wetting. A moisture content range of plus or minus 3 percentage points from the optimum moisture of the fill material is recommended. We recommend that the contractor have equipment on site during earthwork for both drying and wetting of fill soils.

Where construction traffic or weather has disturbed the subgrade, the upper 8 inches of soils intended for structural support should be scarified and re-compacted. Field density tests to determine the degree of compaction should be performed for every 2500 square feet of fill area, with a minimum of two tests per lift.

6.5 Surface Water/Groundwater Control

Subsurface water for the purposes of this report is defined as water encountered below the existing ground surface. Based on the subsurface water data obtained during our exploration program, we do not generally anticipate that subsurface water will be encountered during anticipated earthwork or shallow foundation excavations at the site. However, the contractor should be prepared to dewater should water levels vary from those encountered during the drilling program. Fluctuations in subsurface water levels and soil moisture can be anticipated with changes in precipitation, runoff, and season.

An important aspect to consider during development of this site is surface water control. During the construction, we recommend that steps be taken to enhance surface flow away from any excavations and promote rapid clearing of rainfall and runoff water following rain events. It should be incumbent on the contractor to maintain favorable site drainage during construction to reduce deterioration of otherwise stable subgrades.

6.6 Temporary Excavation Recommendations

Mass excavations and other excavations required for construction of this project must be performed in accordance with the United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations) or other

applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring requirements. The OSHA guidelines require daily inspections of excavations, adjacent areas and protective systems by a "competent person" for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions. All excavated soils, equipment, building supplies, etc., should be placed away from the edges of the excavation at a distance equaling or exceeding the depth of the excavation. F&R cautions that the actual excavation slopes will need to be evaluated frequently each day by the "competent person" and flatter slopes or the use of shoring may be required to maintain a safe excavation depending upon excavation specific circumstances. The contractor is responsible for providing the "competent person" and all aspects of site excavation safety. F&R can evaluate specific excavation slope situations if we are informed and requested by the owner, designer or contractor's "competent person".

6.7 Seepage Erosion

Our subsurface exploration did not find indication of existing karst features such as sinkholes or extensive zones of soft compressible soils. However, karst features are common in this formation. As a result there is some concern for development of a sinkhole at this site. Man-made changes in soil stress and water regime can cause formation of sinkholes by loss of erodible soils that are exposed to ponded or flowing water during grading and other construction activities. We recommend that karst features that become evident during construction and are located outside the proposed building, be remediated as described in the paragraph below.

If stiff overburden soils are removed during site grading, it is possible that sinkholes or solution features may be discovered or that highly erodible soils adjacent to pinnacle rock will be exposed to stormwater runoff. These soils can then be washed into solution cavities in the rock. Consideration must then be given to methods for arresting continued growth of the sinkhole. Support of a structure may require significant redesign where karst features are uncovered in the vicinity of a structure's location. At locations away from structures, we recommend that the raveling over-burden be excavated to expose throats (i.e. solution channels) in the underlying bedrock. Once the contributing throats are exposed by excavation, a concrete or flowable fill plug can be constructed to inhibit future drainage of groundwater and/or overburden into the solution channel. The excavation should then be backfilled to the line and grade of the project plans with acceptable structural fill and properly compacted to reduce the permeability of the backfill soils. Geosynthetics and compacted structural fill may also be required above the plug of the sinkhole.

7.0 CONTINUATION OF SERVICES

We recommend that we be given the opportunity to review the foundation plan, grading plan, and project specifications when construction documents approach completion. This review evaluates whether the recommendations and comments provided herein have been understood and properly implemented. We also recommend that Froehling & Robertson, Inc. be retained for professional and construction materials testing services during construction of the project. Our continued involvement on the project helps provide continuity for proper implementation of the recommendations discussed herein.

The Geotechnical Engineer of Record should be retained to monitor and test earthwork activities, and subgrade preparations for foundations, excavations and floor slabs. It should be noted that the actual soil conditions at the various subgrade levels and footing bearing grades will vary across this site and thus the presence of the Geotechnical Engineer and/or his representative during construction will serve to validate the subsurface conditions and recommendations presented in this report. We recommend that F&R be employed to monitor the earthwork and foundation construction, and to report that the recommendations contained in this report are completed in a satisfactory manner. Our involvement on the project will aid in the proper implementation of the recommendations discussed herein. The following is a recommended scope of services:

- Review of project plans and construction specifications to verify that the recommendations presented in this report have been properly interpreted and implemented;
- Observe all foundation excavations and footing bearing grades for compliance with the geotechnical recommendations.

These services are not included in our current scope of services and can be rendered for an additional cost.

8.0 LIMITATIONS

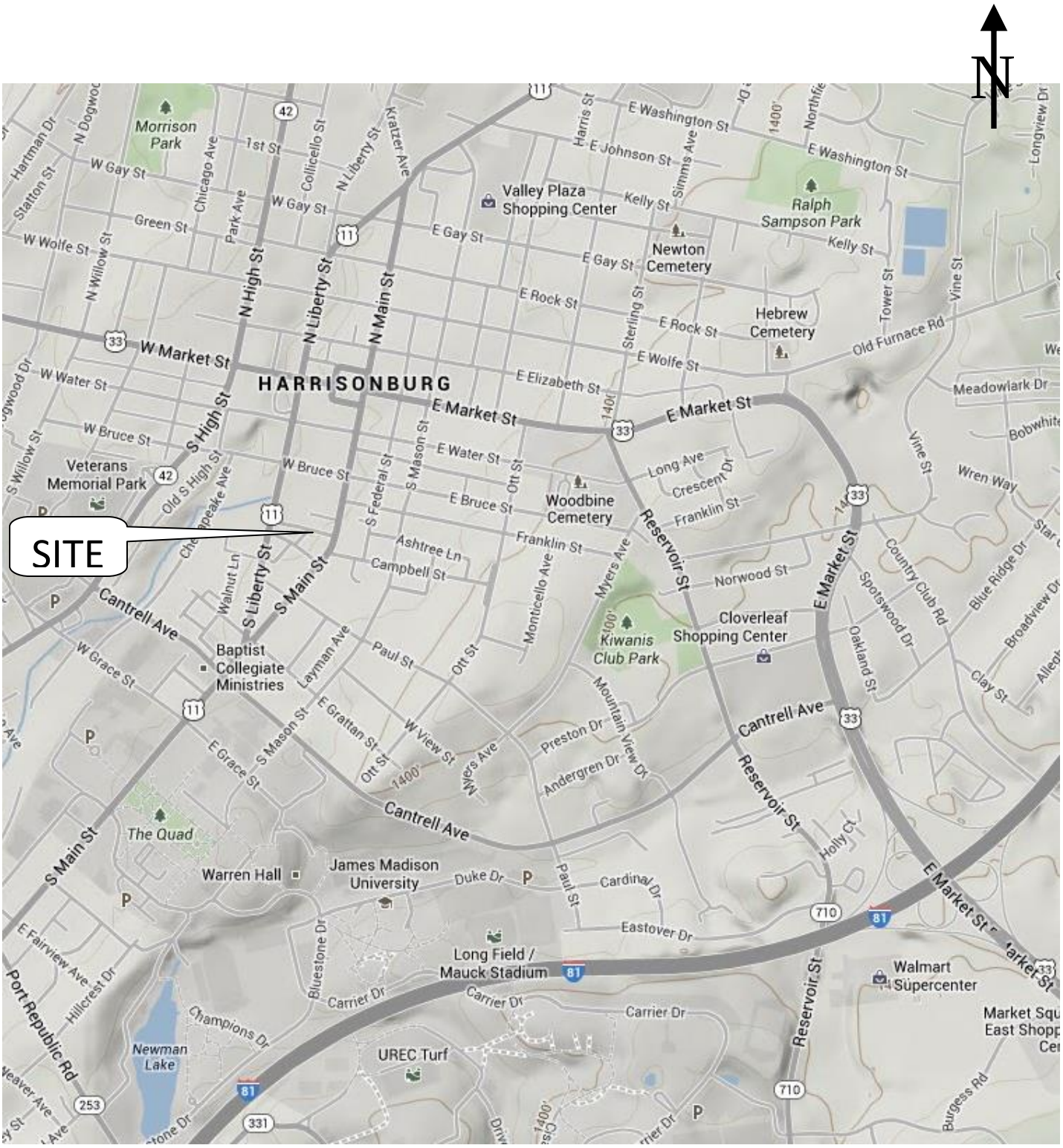
This report has been prepared for the exclusive use of the City of Harrisonburg, or their agent, for specific application to the Harrisonburg Municipal Building project, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. Our evaluations and recommendations are based on design information furnished to us; the data obtained from the previously described subsurface exploration program, and generally accepted geotechnical engineering practice. The evaluations and recommendations do not reflect variations in subsurface conditions which could exist intermediate of the boring locations or in unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our recommendations based upon on-site observations of the conditions.

There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by ASFE, which is included in Appendix III. We ask that you please review this ASFE information.

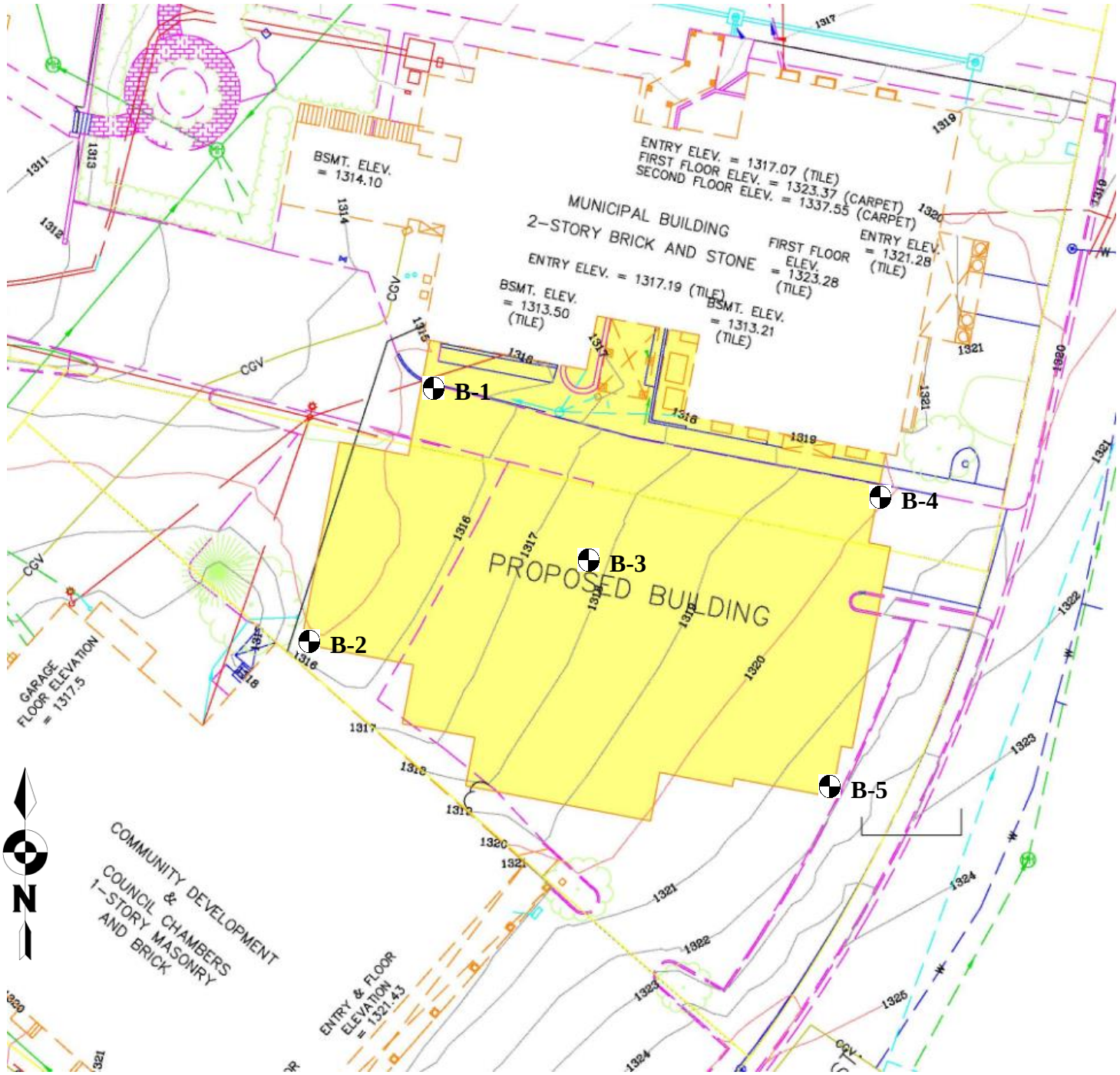
Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork, pavement, and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the design or location of the proposed structure, the recommendations presented in the report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified and/or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

APPENDIX I



FROEHLING & ROBERTSON, INC. *Engineering Stability Since 1881* 6181 Rockfish Gap Turnpike Crozet, Virginia 22932-3330 T 434.823.5154 I F 434.823.4764	Site Location Plan		
	Client: City of Harrisonburg		
	Project: Harrisonburg Municipal Building		
	F&R Project No. 71R3003		
	Date: Oct., 2013	Scale: No Scale	Drawing No.: 1



FROEHLING & ROBERTSON, INC. *Engineering Stability Since 1881* 6181 Rockfish Gap Turnpike Crozet, Virginia 22932-3330 T 434.823.5154 I F 434.823.4764	Boring Location Plan		
	Client: City of Harrisonburg		
	Project: Harrisonburg Municipal Building		
	F&R Project No. 71R3003		
	Date: Oct., 2013	Scale: 1”= 40’	Drawing No.: 2

APPENDIX II

KEY TO BORING LOG SOIL CLASSIFICATION

Particle Size and Proportion

Verbal descriptions are assigned to each soil sample or stratum based on estimates of the particle size of each component of the soil and the percentage of each component of the soil.

Particle Size Descriptive Terms		Proportion Descriptive Terms		
Soil Component	Particle Size	Component	Term	Percentage
Boulder	> 12 inch	Major	Uppercase Letters	>50%
Cobble	3 – 12 inch		(e.g., SAND, CLAY)	
Gravel-Coarse	¾ - 3 inch			
-Fine	#4 – ¾ inch	Secondary	Adjective	20%-50%
Sand-Coarse	#10 - #4		(e.g. sandy, clayey)	
-Medium	#40 - #10			
-Fine	#200 - #40	Minor	Some	15%-25%
Silt (non-cohesive)	< #200		Little	5%-15%
Clay (cohesive)	< #200		Trace	0%-5%

Notes:
1. Particle size is designated by U.S. Standard Sieve Sizes
2. Because of the small size of the split spoon sampler relative to the size of gravel, the true percentage of gravel may not be accurately estimated.

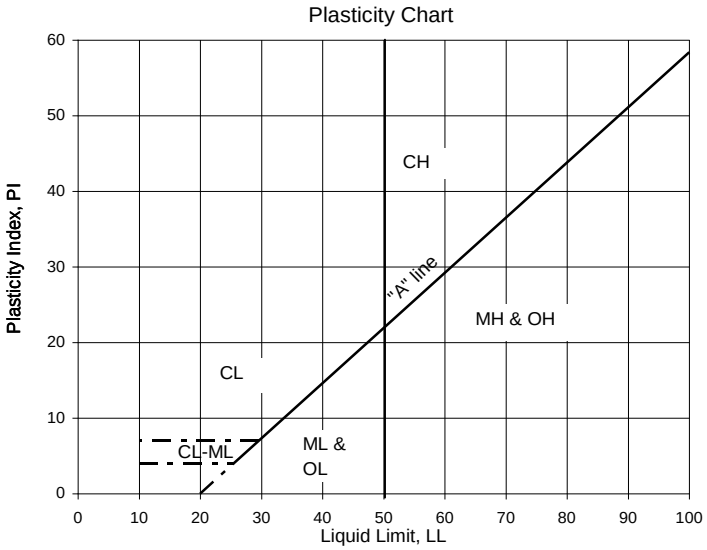
Density or Consistency

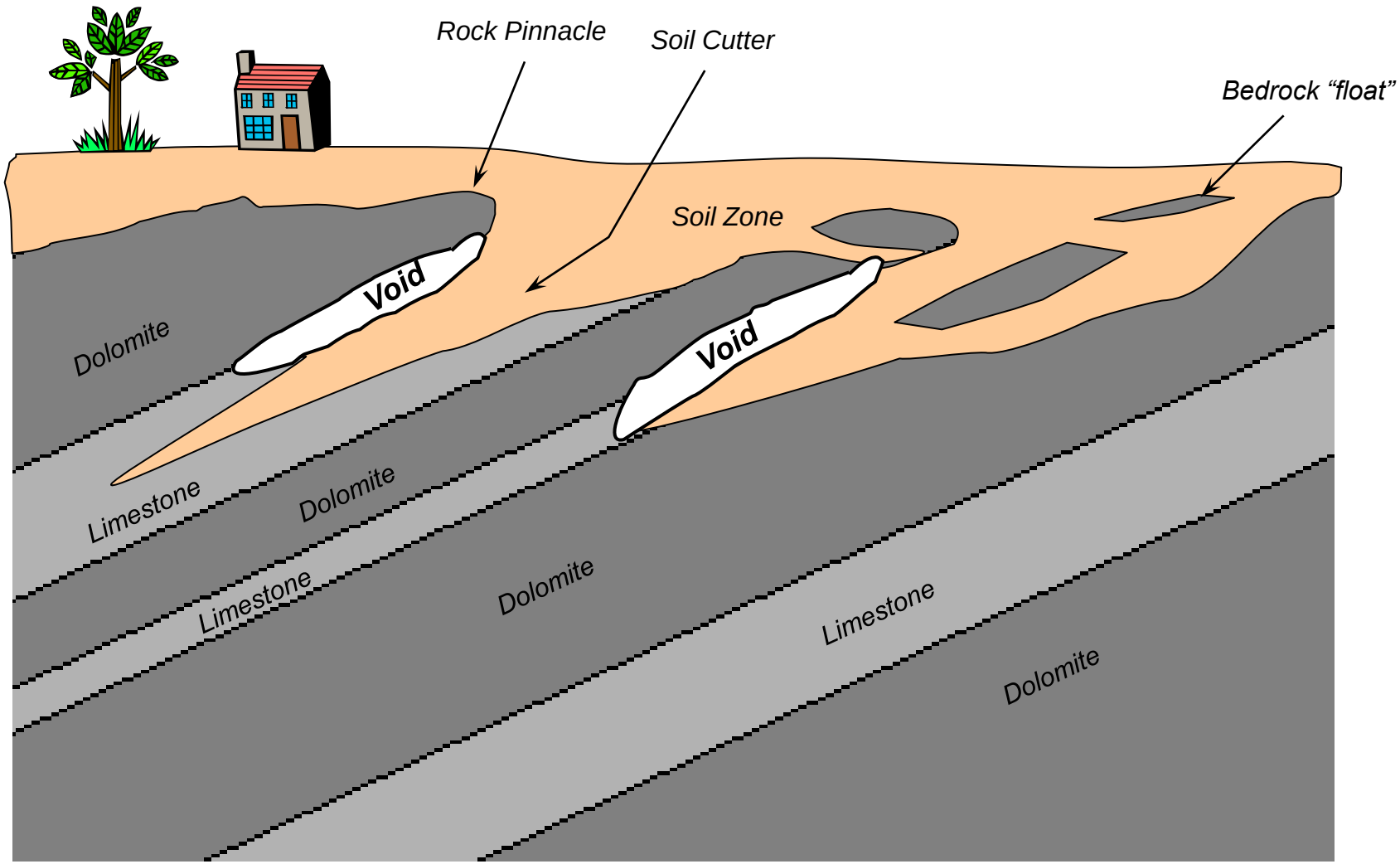
The standard penetration resistance values (N-values are used to describe the density of coarse-grained soils (GRAVEL, SAND) or the consistency of fine-grained soils (SILT, CLAY). Sandy silts of very low plasticity may be assigned a density instead of a consistency.

DENSITY		CONSISTENCY	
Term	N-Value	Term	N-Value
Very Loose	0 – 4	Very Soft	0 – 1
Loose	5 – 10	Soft	2 – 4
Medium-Dense	11 – 30	Medium Stiff	5 – 8
Dense	31 – 50	Stiff	9 – 15
Very Dense	> 50	Very Stiff	16 – 30
		Hard	>30

Notes:
1. The N-value is the number of blows of a 140 lb. hammer freely falling 30 inches required to drive a standard split-spoon sampler (2.0 in. O.D., 1-3/8 in. I.D.) 12 inches into the soil after properly seating the sampler 6 inches.
2. When encountered, gravel may increase the N-value of the standard penetration test and may not accurately represent the in-situ density or consistency of the soil sampled.

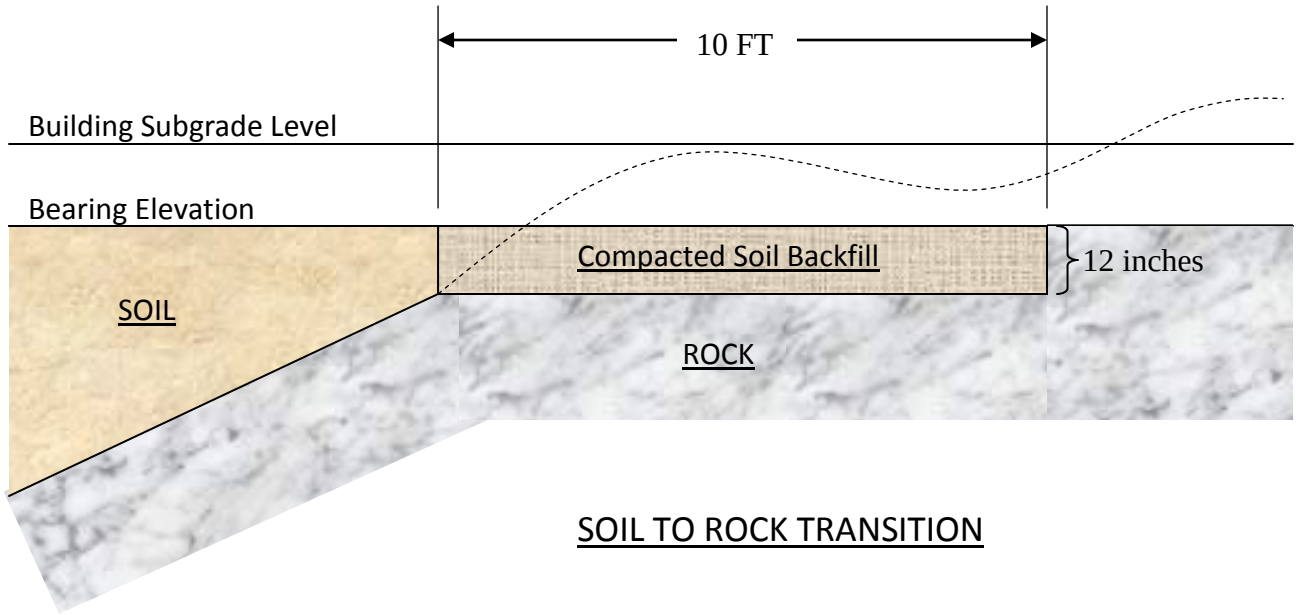
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 Sieve), coarse-grained soils are classified as follows: Less than 5 per cent GW, GP, SW, SP; More than 12 per cent GM, GC, SM, SC; 5 to 12 per cent Borderline cases requiring dual symbols	$C_u=D_{60}/D_{10}$ greater than 4; $C_c=(D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or PI greater than 7	
	Sands (More than half of coarse fraction is smaller than No.4 sieve size)	Clean sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines		$C_u=D_{60}/D_{10}$ greater than 6; $C_c=(D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line or PI greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity			
	Highly organic soils		Pt	Peat and other highly organic soils			

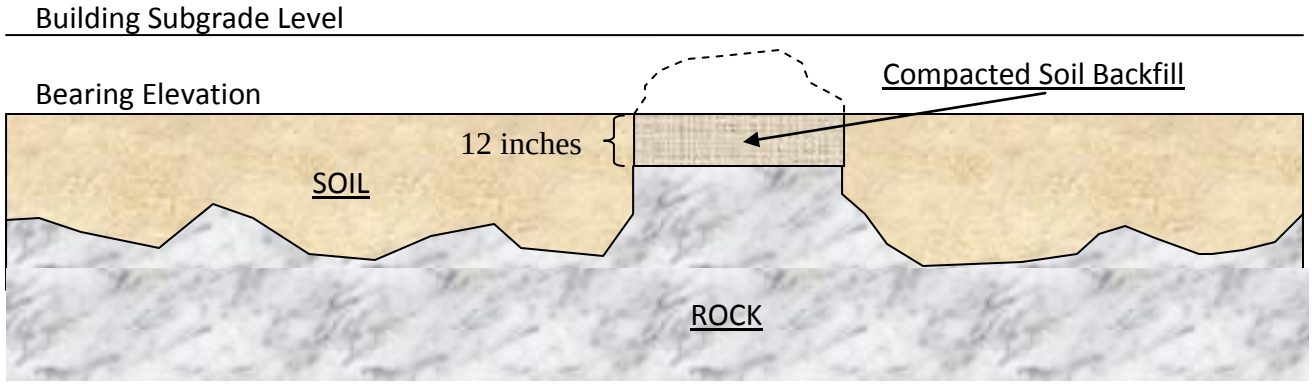


Conceptual model of the site geology including alternating limestone and dolomite beds undergoing differential weathering. The weathering results in deep soil cutters in the limestone, tabular pinnacles of dolomite, and detached rock fragments often called "float". Voids form primarily in the limestone beds at the interface with the dolomite beds.
(Adapted from report by ATS International)

Drawing No. 3



SOIL TO ROCK TRANSITION



ISOLATED ROCK PINNACLE

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
6181 Rockfish Gap Turnpike
Crozet, Virginia 22932-3330
T 434.823.5154 I F 434.823.4764

Rock Sub-Excavation Detail		
Client: City of Harrisonburg		
Project: Harrisonburg Municipal Building		
F&R Project No. 71R3003		
Date: Oct., 2013	Scale: none	Drawing No.: 4

Froehling and Robertson, Inc.

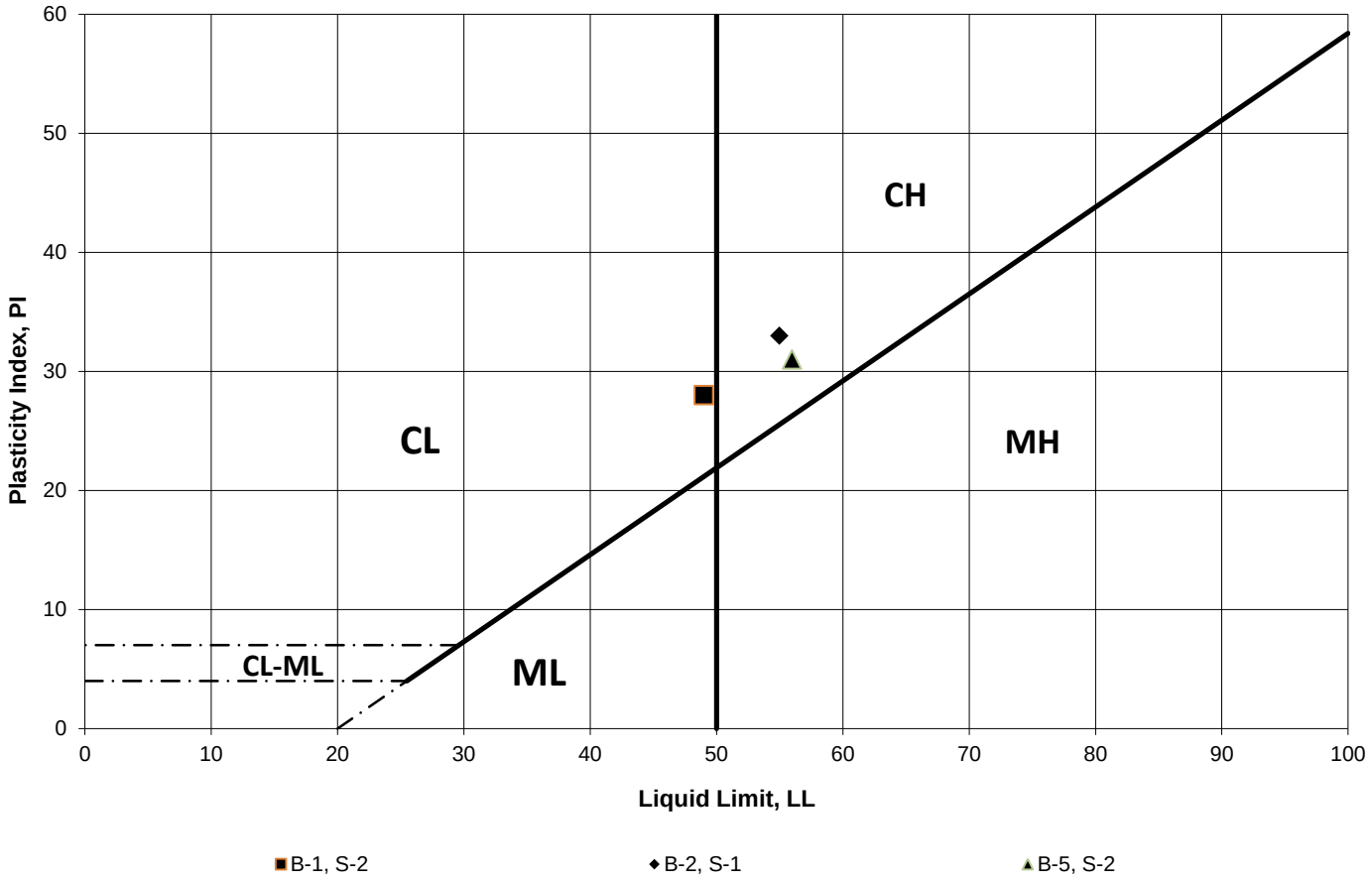
Crozet, Virginia

Laboratory Testing Summary

Project Number: 71R-3003 **Project Name: Harrisonburg Municipal Building** **Date: Oct-13**

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	% Gravel (> #4)	% Sand	% Silt/Clay (< #200)	Compaction		Soaked CBR Value	Other
											Maximum Dry Density (pcf)	Optimum Moisture (%)		
B-1	2	3.5-5	20.9	CL	49	21	28	0.2	7.0	92.8				
B-1	3	6-7.5	25.5											
B-1	4	8.5-10	30.4											
B-2	1	1-2.5	24.4	CH	55	22	33	0.0	4.2	95.8				
B-4	1	1-2.5	26.8											
B-4	2	3.5-5	23.9											
B-4	3	6-7.5	21.1											
B-5	1	1-2.5	18.9											
B-5	2	3.5-5	24.1	CH	56	25	31	0.4	9.5	90.1				
B-5	3	6-7.5	28.0											

PLASTICITY CHART



Boring No.	Sample No.	Sample Depth (Ft)	Moisture %	USCS	Liquid Limit	Plastic Limit	Plasticity Index	% Fines
B-1	2	3.5-5	20.9	CL	49	21	28	92.8
B-2	1	1-2.5	24.4	CH	55	22	33	95.8
B-5	2	3.5-5	24.1	CH	56	25	31	90.1

FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
6181 Rockfish Gap Turnpike, Crozet, VA 22932-3330 I USA
T 434.823.5154 I F 434.823.4764

Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
Location: Harrisonburg, VA
Project No.: 71R-3003

FROEHLING & ROBERTSON, INC.

BORING LOG

Boring: B-1 (1 of 1)

Project No: 71R3003
Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
City/State: Harrisonburg, Virginia

Elevation: 1315 ±
Total Depth: 12.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 9/23/13
Driller: Wilson

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
1314.0	1.0	4 inches of asphalt underlain by 8 inches of gravel	2-1-1	1.0	2	Subsurface water was not encountered during drilling or upon auger removal. Cave-in occured at 2 ft.
		Dark Brown, Moist, Soft, Lean CLAY (CL), Trace Sand		2.5		
1311.5	3.5	**RESIDUUM**	4-5-6	3.5	11	
		Dark Brown, Moist, Stiff, Lean CLAY (CL) **RESIDUUM**		5.0		
1309.0	6.0	Brown, Moist to Very Moist, Stiff, Fat CLAY (CH) **RESIDUUM**	3-6-9	6.0	15	
				7.5		
			3-4-7	8.5	11	
				10.0		
1303.0	12.0	Auger Refusal at 12 Feet				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON, INC.

BORING LOG

Boring: B-2 (1 of 1)

Project No: 71R3003
Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
City/State: Harrisonburg, Virginia

Elevation: 1315 ±
Total Depth: 12.5'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 9/23/13
Driller: Wilson

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
1314.6	0.4	Surficial Organic Soils				
		Dark Brown, Moist, Medium Stiff, Fat CLAY (CH) **RESIDUUM**	2-3-4	1.0	7	
				2.5		
1311.5	3.5	Dark Brown and Gray, Moist, Very Stiff, Gravelly Fat CLAY (CH), Some Sand **RESIDUUM**	2-9-17	3.5	26	Subsurface water was not encountered during drilling or upon auger removal. Cave-in occured at 2 ft.
				5.0		
1309.0	6.0	Dark Brown, Moist, Stiff to Medium Stiff, Fat CLAY (CH) **RESIDUUM**	4-7-7	6.0	14	
				7.5		
			3-3-4	8.5	7	
				10.0		
1302.5	12.5	Auger Refusal At 12.5 Feet				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON, INC.

BORING LOG

Boring: B-3 (1 of 1)

Project No: 71R3003
Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
City/State: Harrisonburg, Virginia

Elevation: 1318 ±
Total Depth: 20.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 9/23/13
Driller: Wilson

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
1317.2	0.8	4 inches of asphalt underlain by 5 inches of gravel	1-2-2	1.0	4	
		Brown, Moist, Soft, Lean CLAY (CL) **RESIDUUM**		2.5		
1314.5	3.5	Light Brown, Moist to Very Moist, Stiff to Medium Stiff, Fat CLAY (CH) **RESIDUUM**	2-4-6	3.5	10	Subsurface water was not encountered during drilling or upon auger removal. Cave-in occured at 2 ft.
				5.0		
			3-4-7	6.0	11	
				7.5		
			3-4-6	8.5	10	
				10.0		
			2-3-4	13.5	7	
				15.0		
1299.5	18.5	Soft Weathered Rock when sampled becomes a Brown and Gray, Wet, Hard, Gravelly Fat CLAY (CH) **SOFT WEATHERED ROCK**	50/6	18.5	100+	
1298.0	20.0	Auger Refusal at 20 Feet				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON, INC.

BORING LOG

Boring: B-4 (1 of 1)

Project No: 71R3003
Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
City/State: Harrisonburg, Virginia

Elevation: 1320 ±
Total Depth: 12.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 9/23/13
Driller: Wilson

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
1319.3	0.7	4 inches of asphalt underlain by 6 inches of gravel	1-3-3	1.0		
		Brown, Moist, Medium Stiff, Fat CLAY (CH), Little Sand		2.5	6	
1316.5	3.5	**RESIDUUM**	5-19-16	3.5		Subsurface water was not encountered during drilling or upon auger removal. Cave-in occured at 2 ft.
		Brown and Gray, Moist, Hard, Gravelly Fat CLAY (CH), Some Sand		5.0	35	
1314.0	6.0	**RESIDUUM**	5-9-9	6.0		
		Dark Brown, Moist, Very Stiff, Fat CLAY (CH) **RESIDUUM**		7.5	18	
1311.5	8.5	Dark Brown, Moist, Hard, Fat CLAY (CH) **RESIDUUM**	3-15-16	8.5		
				10.0	31	
1308.0	12.0	Auger Refusal at 12 Feet				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON, INC.

BORING LOG

Boring: B-5 (1 of 1)

Project No: 71R3003
Client: City of Harrisonburg
Project: Harrisonburg Municipal Building
City/State: Harrisonburg, Virginia

Elevation: 1322 ±
Total Depth: 14.0'
Boring Location: See Boring Location Plan

Drilling Method: HSA
Hammer Type: Automatic
Date Drilled: 9/23/13
Driller: Wilson

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
1321.2	0.8	4 inches of asphalt underlain by 5 inches of gravel				
		Brown, Moist, Medium Stiff, Lean CLAY (CL) **RESIDUUM**	2-3-4	1.0	7	
				2.5		
1318.5	3.5	Brown, Moist to Very Moist, Stiff, Fat CLAY (CH) **RESIDUUM**	3-4-7	3.5	11	Subsurface water was not encountered during drilling or upon auger removal. Cave-in occured at 3 ft.
				5.0		
			3-5-9	6.0	14	
				7.5		
			3-4-5	8.5	9	
				10.0		
1308.5	13.5		50/1	13.5		
1308.0	14.0	Soft Weathered Rock when sampled becomes a Gray and Brown, Very Moist, Very Dense, Clayey GRAVEL (GC) **SOFT WEATHERED ROCK**			100+	
		Auger Refusal at 14 Feet				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON, INC.

SUBSURFACE PROFILE

Plot Based on Elevation

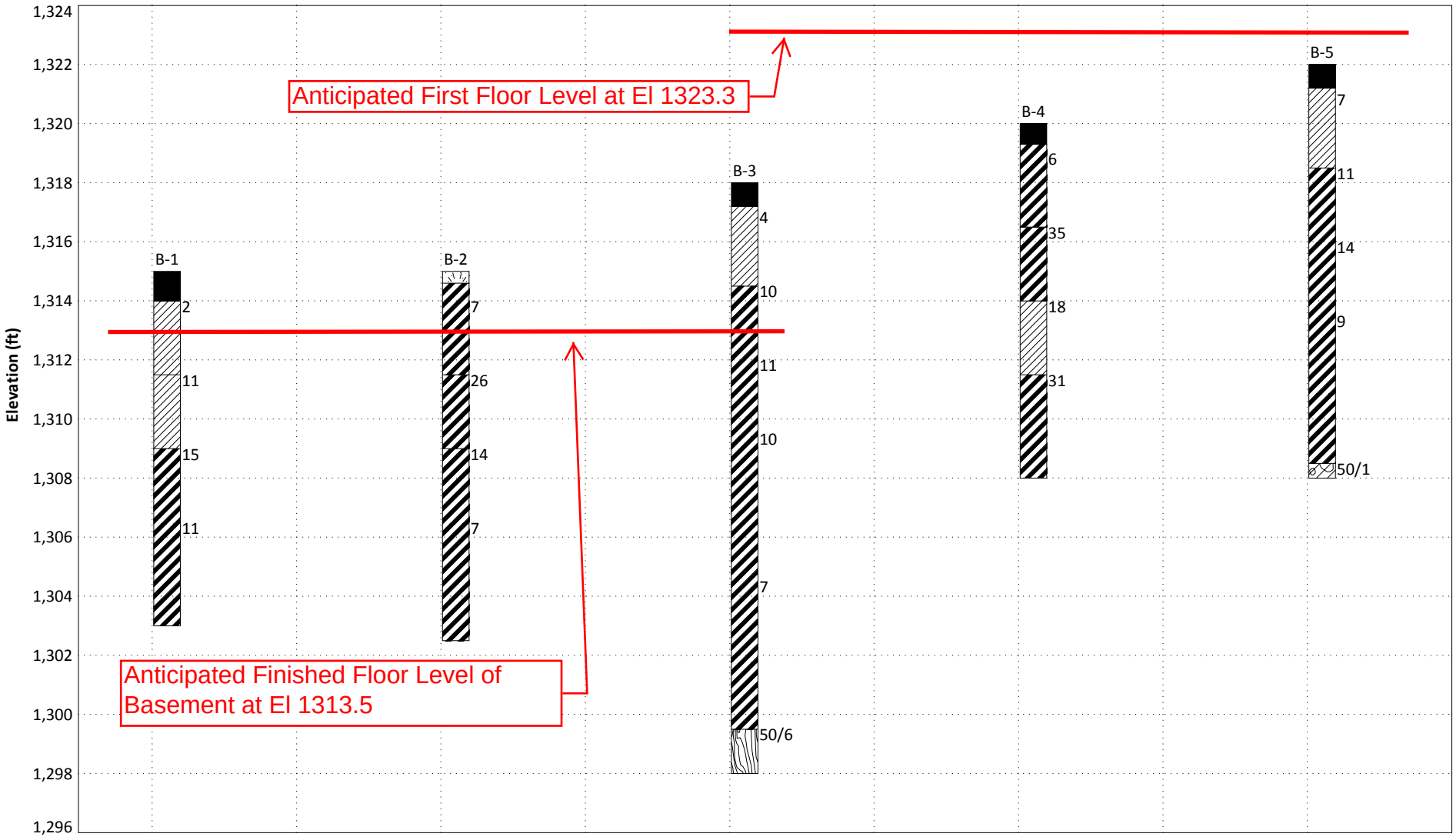
Profile Name: 1

Project No: 71R3003

Client: City of Harrisonburg

Project: Harrisonburg Municipal Building

City/State: Harrisonburg, Virginia



ELEV_LANDSCAPE_8.5X11 71R3003.GPJ F&R.GDT 10/15/13

APPENDIX III

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

Copyright 2004 by ASFE, Inc. Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with ASFE's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of ASFE, and only for purposes of scholarly research or book review. Only members of ASFE may use this document as a complement to or as an element of a geotechnical engineering report. Any other firm, individual, or other entity that so uses this document without being an ASFE member could be commiting negligent or intentional (fraudulent) misrepresentation.

IIGER06045.0M